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THE CLASSIFICATION OF THE RHYNCHOPHOROUS COLEOPTERA.*

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At the meeting of the Academy held in Washington, Jan., 1867, I had the honor to offer some remarks† upon the systematic value of the great complex of Coleopterous insects known as Rhynchophora.

It was my intention, as then stated, to follow the memoir just mentioned with another, in which the classification of the Rhynchophora and separation into families should be discussed, in the hope of developing a more satisfactory system of arrangement than had been thus far obtained.

Circumstances have prevented me from following this particular line of investigation to a definite result, until within a short time, though it has frequently occupied my attention for brief intervals. The time, however, has not been altogether lost, for I found that, with each return to the investigation, I obtained an additional, though small insight into the constitution of this complex, which has been the subject of repeated efforts by the most laborious and successful students of entomology in Europe.

* Read before the National Academy of Sciences, Washington, April 21, 1874.

† Am. Jour. Science and Arts, xliv, July, 1867.

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The bases of the classification of the Rhynchophora which have been proposed are briefly these:

I. Schonherr* treated the great mass of these insects (excluding only the Scolytidæ), as constituting a single family, divided as follows: —

A. Antennæ not geniculate; antennal grooves wanting; . ORTHOCERI.
Bruchides, Anthribides, Camarotides, Attelabides, Rhinomacerides, Ithycerides, Apionides, Rhamphides, Brenthides, Cylades, Uloceridæ, Oxyrhynchides.

B. Antennæ geniculate; grooves almost always distinct; GONATOCERI.
a. Rostrum short, deformed, antennæ subterminal; *Brachyrhynchi.*
* Antennal grooves extending below the eyes; Brachycerides, Entimides, Pachyrhynchides, Brachyderides, Cleonides, Molytides, Byrsopides (the last with the rostrum received in aprosternal excavation).
** Antennal grooves directed towards the eye;
Phyllobiides, Cyclomides, Otiorhynchides.
b. Beak cylindrical, slender, antennæ inserted far behind the tip: Erirhinides, Cholides, Cryptorhynchides, Cionides, Rhynchophorides, Conoderides, Cossonides, Dryophthorides. *Mecorhynchi.*

In the gradual progress of the work this last legion, the Mecorhynchi, were divided into Synmerides, having the front coxæ contiguous, and Apostasimerides, having them distant.

The distinctions between the tribes above mentioned were founded mostly on insignificant and evanescent modifications in the form of the beak and antennæ; so that with the immense mass of genera and species described, it became quite impossible to determine either from the work itself.

II. Although the faults found with this artificial system were neither few nor vaguely expressed, yet it was not until the progress (1863) of his admirable work on the Genera of Coleoptera by my deceased friend Prof. Lacordaire required this immense labor to be done over again, that any attempt was made at a new arrangement; the system of Lacordaire was essentially this:

The series was divided into six families; Curculionidæ, Bruchidæ, Anthribidæ, Brenthidæ, Uloceridæ and Scolytidæ. Of these the Bruchidæ were recognized as having scarcely any relations

* Genera et Species Curculionidum, Paris, 1833-1844.

with the other families, and pertaining rather to the Chrysomelidæ, with which they have since been associated by most authors.

The Bruchidæ and Anthribidæ were characterized by having a distinct labrum; the Scolytidæ by the compressed and dentate tibiæ, while the Brenthidæ were separated rather by form than by any distinct structural character.

The Curculionidæ were then divided according to the size of the mentum, into

I. Mentum closing the buccal space, and concealing the maxillæ . . . . . ADELOGNATHI.
Eyes rounded, prothoracic lobes indistinct, . . *Cyclophthalmes.*
Eyes large, depressed, transverse, narrowed below, prothoracic lobes well marked, ... *Oxyophthalmes.*
II. Mentum smaller, maxillæ visible . . . . . PHANEROGNATHI.
A. Front coxæ contiguous or nearly so, . . . *Synmerides.*
a. Pygidium covered by the elytra; claws not appendiculate.
Metasternum short; episterna narrow;
Gular peduncle wanting:
Gular peduncle distinct:
Metasternum long; episterna rather wide:
Antennæ geniculate:
Antennæ straight.
b. Pygidium exposed, *or* claws appendiculate:
Ventral segments not angulated at the sides:
" " angulated:
B. Front coxæ separated by the prosternum, which is frequently channelled for the reception of the beak, . *Apostasimerides.*
a. Oral organs normal. Club of antennæ annulated; 3d joint of tarsi bilobed.
Mesothoracic epimera not ascending:
" " ascending.
b. Oral organs abnormal; 1st joint of antennal club usually very large, corneous, 3d joint of tarsi rarely bilobed.
Pygidium exposed.
" covered by elytra.

Each of these divisions contains several tribes differentiated by characters of smaller importance, and not unfrequently indefinite.

III. The next attempt at a general classification was made by Mr. H. Jekel.* This excellent author recognized with great clearness, and defined with tolerable precision, the following eight

* Annales Ent. Soc. France, 1864, p. 537. Ins. Saundersiana, 155 sqq., 1860.

principal types among the Rhynchophora: Bruchides, Anthribides, Attelabides, Curculionides, Calandrides, Cossonides, Scolytides and Brenthides. The last cited memoir is occupied chiefly with a further development of the classification of the largest of these, the Curculionides proper, and in it he proceeds to separate as sub-families* Brachycerides, Byrsopides and Amycterides, epigeal forms in which the tarsi are not dilated, and not furnished with brush-like hairs beneath. Having thus isolated them the great mass remaining is divided into

Body dissimilar in form ♂, ♀, narrower in ♂	PLATYGNES.
Beak similar in both sexes	*Homorhines.*
Beak dissimilar	*Heterorhines.*
Body nearly or quite of the same form ♂ ♀:	
Pygidium covered by the elytra, body pollinose or pubescent	ISOGYNES.
Pygidium exposed or covered; body squamose, etc.	METRIOGYNES.
Pygidium covered	*Cryptopyges.*
Pygidium exposed	*Gymnopyges.*

The principal types contained in each of these three grand divisions are then characterized in a very clear manner; but for a proper understanding of this system, a vast improvement on all that preceded, the reader must refer to the original memoir. In developing the arrangement of the tribes represented in our fauna, I shall be largely indebted to the views expressed in this most valuable memoir of Mr. Jekel.

There remain to be mentioned two faunal contributions to the history of this subject:

1. A series of remarks by Mr. Suffrian,† in which the German species of several genera, not before carefully studied, are more fully elucidated, and various criticisms upon Schönherr's system made.‡ The necessity of a more careful study of the tibiæ and tarsi, almost neglected by Schönherr is insisted on, and an arrangement of the German genera in groups upon these characters is given.

2. That most admirable work of Prof. C. G. Thomson,§ to

* Mr. Jekel gives to the anomalous groups this subordinate position, rather, as he says "pour ne pas heurter les idées généralement admises," than in accordance with his own views, which would lead him to regard them as I have done, as genuine families.

† Bermerkungen über einige deutsche Rüsselkäfer: Stettin, Ent. Zeitsch. i–ix.

‡ See specially *op. cit.*, 1847, 157.

§ Skandinaviens Coleoptera, vii, Lund, 1865.

which no entomologist ever refers without finding original material by which he can profit; a remarkable instance of the good results to be obtained by a careful and intelligent study of a very limited fauna. The Rhynchophorous series is divided as follows:

Segments of the abdomen immovable, 2d and 3d nearly equal
ISOTOMA.
Bruchidæ, Anthribidæ (including Urodon), Rhinomaceridæ, Attelabidæ.
Abdomen with the 1st and 2d segments connate, the remaining three movable, the 2d usually much longer than the 3d . ANISOTOMA.
Apionidæ, Curculionidæ, Cossonidæ (including Calandra), Tomicidæ.

From a survey of the different schemes of arrangement which have been thus briefly reviewed, it is evident that while the principal types of the Rhynchophorous series, and the main divisions of the great family Curculionidæ have been clearly perceived, the attempts to define these important forms have failed in a greater or less degree, on account of the want of proper subordination in the characters made use of: all of them natural, all of them important, though in a less degree than supposed by the expounder of each particular system.

To supplement the memoirs above referred to, there came in more recent times the beginning of a systematic study of our species of Curculionidæ by Dr. George H. Horn, a careful and conscientious study of the Calandridæ and Cossonidæ and of some Mecorhynch genera of the United States.* In the introductory remarks he observes:—

"One character is mentioned in the following pages that appears to have escaped notice. In most if not all of the genera of *Mecorhynques*, the males have eight and the females seven dorsal abdominal segments. The *Calandrides* and *Cossonides* appear not to possess this character, as also all the *Brachyrhynques* which I have had time to examine."

The value of this original observation of Dr. Horn is very great, but the limitation which he has placed upon it, though correct as regards the Calandride and Cossonide types, is erroneous as regards the Brachyrhynes, which have the abdominal sexual characters precisely as in the genera in which he first observed them. So too have the Brenthidæ, and all the anomalous sub-families of Curculi-

*Contributions to a Knowledge of the Curculionidæ of the United States. Proc. Am. Philosophical Soc. 1873, 407.

onidæ in the Jekelian system. It appears therefore that this peculiarity of structure is of much more importance than was supposed by Dr. Horn, and that it must in reality be the defining character for the division of the Rhynchophora into primary series, of more than family value. I therefore prepared a series of dissections of each of the well recognized Rhynchophorous types within my reach, and have come to the conclusion that they may be arranged in three sets, each of which has a corresponding value to the individual series of normal Coleoptera (*e.g.* Adephaga, Clavicornia, Lamellicornia, etc.); and upon subordinate characters (some of which have been already employed in the classifications above mentioned, though in an empirical manner) into families as follows.

SERIES 1. HAPLOGASTRA.

Abdomen alike in both sexes; dorsal segments 7, coriaceous, with the exception of the 7th which forms the pygidium, and which is small and corneous; ventral segments not prolonged upwards into a sharp edge; elytra without lateral fold on the inner surface, epipleuræ usually distinct, antennæ straight, 11-jointed. Ungues usually bifid or toothed, rarely (Rhinomacer) simple; Front coxæ conical, prominent, prosternum very short in front of the coxæ. The beak varies in length and thickness, but not according to sex, so far as I know: the front coxæ are contiguous, except in one genus of Rhynchitidæ (Pterocolus); the ventral sutures of the abdomen are straight. The mandibles and tibiæ vary in form, and furnish convenient characters for division into families:—

A. Ventral segments nearly equal in length; epipleural indistinct; tibial spurs small; claws simple (always ?). Mandibles simple, flat; labrum distinct . . . . . RHINOMACERIDÆ.

B. Ventral segments diminishing in length; epipleuræ distinct; labrum wanting; claws bifid, or appendiculate

Mandibles flat, toothed on each side; tibial spurs small RHYNCHITIDÆ.

Mandibles stout, pincer shaped, tibial spurs large ATTELABIDÆ.

The affinities of this series are in an ascending direction with the rostrated Heteromera (Oedemeridæ and Pythidæ); this is indicated by the softer tissues in Rhinomaceridæ, and certain Rhynchitidæ, and also by the presence of a labrum in the former. In a descending direction the Attelabidæ lead to the true Curculionidæ,

and the Rhynchitidæ to the Belidæ, the last family in the third series of Rhynchophora.

The habits of the species of this series are peculiar, and quite different from those of the next series, and indicate as is wisely observed by Lacordaire,* for the care of their progeny, an industry which appears here for the first time in the family. I cannot describe the results of this instinctive or intelligent industry better than by condensing the account of the author just cited, referable however to European species.

1. Rhinomaceridæ. The European species deposits the eggs in the male flowers of *Pinus maritimus*, the development of which is thus prevented. I may be allowed to observe that this synthetic genus, the nearest approach in the Rhynchophora to the lower Heteromera, and therefore the representative of old forms, clings to an old and synthetic type of vegetation.

2. Rhynchitidæ. Some of the species of Rhynchites roll leaves in the manner of the next family. Others deposit their eggs in young fruit, the kernel of which is eaten by the larva; others again place the eggs in the undeveloped buds of trees, which are thus destroyed.

3. Attelabidæ. In the spring the females roll up the leaves of trees, and deposit in each an egg. After emerging from the egg the young larvæ eat the inside layer of the case which covers them, which they probably leave at a later period, when their growth is complete, to perfect their metamorphosis under ground.

These three families are of small extent, and but little need be said regarding their classification.

RHINOMACERIDÆ.

This family is represented in our fauna by two species, one on each slope of the continent, and is easily recognized by the depressed, curved and acute mandibles, and distinct labrum. The pygidium is covered by the elytra, which are punctured without any appearance of striæ. On the inner face there is no trace of a lateral fold: the epipleuræ are indistinct.

ATTELABIDÆ.

Four species of Attelabus on the Atlantic slope are the only representatives thus far known in our fauna. The beak is stouter

*Gen. Col. vi, 543.

than in the preceding family, and the mandibles thicker and stronger. The epipleuræ are quite distinct, and there is no trace of a lateral fold on the inner face of the elytra. The pygidium is not covered by the elytra, and is impressed along its upper margin for the reception of the apical edge of the elytra.* The tibiæ are armed with large spurs.

RHYNCHITIDÆ.

The peculiar form of the mandibles requires the separation of these genera as a distinct family. The teeth on the inner side are well developed as usual, but in addition, the apex is prolonged outwards into an acute process, behind which is another large tooth.†

The front coxæ are usually contiguous, large and conical, in one genus (Pterocolus) widely separated. The pygidium is either exposed (Rhynchites, Pterocolus) or covered by the elytra (Eugnamptus, Auletes). The epipleuræ are narrow, but distinct, and on the inner face of the elytra remote from the margin may be seen a short straight fold, the homologue of the well defined fold which limits the lateral groove for the reception of the side margin of the ventral segments observed in all the following families.

Series II. ALLOGASTRA.

Abdomen dissimilar in the two sexes; dorsal segments 1–6 coriaceous or membranous, 7th large, corneous, undivided in ♀, divided into two in ♂; ventral segments prolonged upwards forming a sharp edge, fitting into a corresponding groove on the inner face of the elytra, which are without epipleuræ.

The beak and oral organs vary greatly in form, as do also the antennæ, the tarsi, the ungues, and the position of the coxæ; the 1st and 2d ventral segments are most frequently connate, and the 3d is always shorter than the 2d; the 5th is longer than the 4th.

The following families seem to be indicated by the material I have examined:—

A. Antennæ with a solid annulated club:
  a. Tarsi narrow:
    Gular margin very prominent; mentum retracted;

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* Compare in this relation the curious notch in the front part of the pygidium of Anthribidæ, for the reception of the sutural angles of the elytra.

† This character was first observed by Thomson, who observes (Sk. Col. vii, 28) concerning his tribe Rhynchitina, "mandibulæ depressæ, extus excisæ, intus dentatæ."

Prosternum not excavated; . . . . . AMYCTERIDÆ.
Prosternum excavated: . . . . . BYRSOPIDÆ.
Gular margin not prominent, mentum large, concealing the mandibles, which are not scarred at tip BRACHYCERIDÆ.
b. Tarsi dilated, usually with a brush of hair beneath:
Mandibles with deciduous tip, leaving a scar OTIORHYNCHIDÆ.
Mandibles simple, usually pincer-shaped. . CURCULIONIDÆ.
B. Antennæ with 11 separate joints. . . . BRENTHIDÆ.

Concerning Amycteridæ and Brachyceridæ, but little need be said. They are very peculiar and easily recognized forms, not represented in our fauna.

The first is Australian; the antennæ are slender, and geniculated; the beak short and stout, deeply emarginate at tip, alike in both sexes; the buccal opening is very large, and the cavity is filled almost completely by the mandibles, which are convex, hairy on the greater part of the front surface, deflexed, deeply concave beneath; the gular margin is thickened and prominent, so that a deep cavity is seen between the gula and the mandibles, in which the mentum and oral organs are concealed from view; the eyes are small and nearly round in some, narrowed beneath in others. The front coxæ are contiguous, the prosternum very short; the elytra are connate and extend far over the flanks, so that the side pieces both of the meso- and metathorax are concealed. The dorsal segments of the abdomen are membranous, except the last which is very large, corneous, and convex, more so in ♂ than in ♀, in the former it is truncate behind, exposing a semicircular 8th segment, from under which protrudes (Psalidura) a very powerful and complex genital armature, consisting of a large pair of forceps, conical obtuse, punctured and hairy, under which and seen only from below is a pair of transverse, thin, polished, corneous plates, also meeting on the median line; between them and the forceps is a large deep cavity. The ventral segments are scarcely less singular; the 1st and 2d segments large, flat, connate, united by a sinuate suture; 3d and 4th very short, separated by deeply excavated straight sutures, 5th much larger, in ♂ very deeply and semicircularly excavated, almost to the base, with a tuft of stiff bristles each side at the front edge of the excavation; in the ♀ this segment is flat, and meets the last dorsal at tip in the usual manner; on the sides the lateral upward extension of the 5th ventral is very large, but the spiracle is visible; the extension of the 4th and 3d segments

are much smaller, and imbricated upon the 5th and 4th respectively; the side margin of the 1st and 2d is very narrow, and the side pieces of the metasternum are scarcely visible. The elytra are connate, with the lateral groove of the inner face narrow and sharply defined, becoming broader and indefinite at the posterior fourth; on the inner face are seen eight rows of punctures, corresponding to ridges of tubercles on the back. The tarsi are 4-jointed, narrow, or at least the 3d joint not wider than the others, deeply grooved beneath; the tibiæ are truncate, without spurs, the front pair a little incurved at tip in both sexes. Claws simple, not contiguous.

The genera of this family are stated by Mr. Jekel,* to differ by the form of the eyes, some being Cyclophthalmes, others Oxyophthalmes; also in the antennal grooves, some being Obliquiscrobes, others Lateriscrobes. The vestiture of the under surface of the tarsi varies in different genera; in Psalidura they are spongy sericeous beneath, in others ciliate or spinous.

In other genera, the sexual characters are less remarkable than in Psalidura, and will be found to consist chiefly in the division of the last dorsal segment into two, as in the other families of the series.

The Brachyceridæ are restricted to Africa and the neighboring parts of Europe and Asia. They are stout insects, with ventricose elytra, suddenly deflexed behind, and extending far upon the flanks, like the first tribes of Tenebrionidæ, which they also resemble in the large mentum, flat, filling the whole of the buccal cavity. The beak is short and stout, thicker at the extremity, alike in both sexes; the antennal grooves are wanting (Episus); or deep and directed downwards, almost confluent in the gular region (Brachycerus, Microcerus). The antennæ are short, straight or feebly geniculate, scape forming less than $\frac{1}{3}$ the length; joints of the funiculus 7, rather short, club solid, obconical, truncate or subacuminate at tip. Eyes rounded or transverse and acuminate at the lower end. Mandibles stout, short, more prominent in Brachycerus, where they have the lower margin more produced into a cutting edge: the front surface is rough and somewhat angular, but without any trace of the rounded scar seen in Otiorhynchidæ. The scutellum is scarcely visible; the elytra, as above mentioned, are ventricose, irregularly tuberculate or costate, very

* Ann. Ent. Soc. France, 1864, 544.

much extended on the flanks, so as to cover the side pieces of the meso- and metathorax; greatly deflexed behind. The lateral groove of the inner face is deep and narrow, becoming wider and obsolete behind. The dorsal segments are membranous, except the last, which is corneous, and divided in ♂ into two as in Curculionidæ. The ventral segments are separated by deep sutures, of which the 1st is sinuate; the 3d and 4th segments are shorter than the others: the lateral extension upwards is narrow; and but slightly wider behind. The front coxæ are contiguous, prominent and subconical, the tibiæ are not dilated, the spurs are small, fixed, projecting inwards, the tarsi 4-jointed, narrow, setose and feebly concave beneath (Brachycerus); pubescent, concave and emarginate beneath (Microcerus); claws large, simple, distant.

BYRSOPIDÆ.

The third of the anomalous families has a more general distribution, and is represented in our fauna by the genus Thecesternus, which forms a separate tribe, distinguished from the other tribes by the prosternal groove for the reception of the beak not extended as far as the front coxæ.

These insects are epigeal, rough and dull colored, with the elytra widely embracing the flanks, but not strongly deflexed behind, concealing the side pieces of the trunk. The beak is very short, not thickened at tip, nor emarginate at the middle; the antennal grooves descend perpendicularly and form a gular constriction: the antennæ are unusually short, imperfectly geniculate, the scape as long as the 1st and 2d joints of the funiculus; the club elongate oval, pointed, distinctly annulated. Eyes transverse, pointed beneath.* Mandibles stout, short, front surface curved and roughly punctured; mentum very small, not placed on a gular peduncle; maxillæ exposed. Prothorax widely lobed in front at the sides, so as to conceal the eyes, when the head is deflexed; deeply excavated beneath for the reception of the beak, cavity closed behind in Thecesternus by a triangular plate of the prosternum, but by the front coxæ in the other genera; coxæ small, globose, contiguous. Elytra connate, widely extended on the flanks, declivous behind, rough; lateral groove of inner face

*Jekel, l. c. 1864, 543, describes the group as being *Adelognathes cyclophthalmes*: Lacordaire (Gen. Col. vi, 293 sqq.) places them in Phanerognathes, and describes the eyes as acuminate below, in which he is correct.

narrow, and well defined; scutellum not visible; humeri in Thecesternus prolonged forwards, so as to extend along the sides of the prothorax. Dorsal segments membranous, last one large, corneous, divided into two in ♂: ventral segments unequal, 1st and 2d very large, more closely connected, suture arcuated: 3d and 4th short, sutures deep, 5th as long as the two preceding; lateral extension moderately wide, wider behind, pygidium articulating with both 4th and 5th ventrals. Legs slender, tibiæ truncate, spurs small, tarsi 4–jointed, narrow, setose beneath.

Several species of Thecesternus are found in the interior regions of the continent, from Illinois to Utah, under dried buffalo excrement, and similar objects.—*To be concluded.*

OBSERVATIONS ON DROSERA FILIFORMIS.

BY WM. M. CANBY.

Some observations on the power of the insect-trapping "thread leaved sundew" to bend its leaves partly or wholly about its prey, may serve to supplement the interesting notes of Mrs. Mary Treat recorded in the December number of the American Naturalist. They were made about the middle of last August during a day's botanical excursion in the vicinity of "Pleasant Mills," New Jersey, and were suggested by Mr. Darwin in the following memoranda:

(1.) "Put a small atom of crushed fly on a leaf of *Drosera filiformis* near the apex and observe whether the solid leaf itself, after twenty-four hours or so, curls over the fly."

(2.) "Rub roughly with the point of a fine needle half a dozen times a few glands, and observe whether they become inflected after a few minutes, or more probably after a few hours."

The place selected for the experiments was the edge of a cranberry meadow exposed during the whole day to the sun, and yet protected by higher ground and trees from the wind, which otherwise might have prevented successful results by blowing and entangling the leaves together. Hundreds of the plants were here growing, most of their leaves being fully extended, while others were yet unfolding from their circinate vernation. At 7

A.M. bits of the common house fly were placed near the apices of a number of leaves, and these were carefully marked in order to distinguish them from the great number of those which had already captured insects or might during the day make a prey of others. They were not visited again until about 7 P.M., the exigencies of botanical collecting taking my companion and myself several miles away. At another place, however, I had an opportunity to corroborate Mrs. Treat's remark upon the power of the leaves to make prisoners of large flies; for I witnessed the capture of a large and strong dipter,—a desperate struggle ensuing which resulted in the prey being permanently held.

On returning in the evening it was found that in the twelve hours which had elapsed, not only had the glandular hairs around bent towards and touched the atoms of fly, but that also in every case the leaves themselves had bent over them. My sketches, made by laying the leaves upon paper and thus getting their exact outline, show a remarkable uniformity in the amount of inflection; it being in each case between 15° and 20°, mostly about 17°. These experiments were further corroborated by observations upon the leaves around, many of which were much more bent, undoubtedly from having held the prey a longer time. In one case indeed, where the capture had evidently been made near the tip of a fully unrolled leaf, it had again curled round the prey so as completely to encircle it.

So far as the limited time available permitted the observation, I could not perceive that it made much difference in the amount of inflection, upon what part of the circumference of the leaf the prey was taken. But if anything the back or outer side was less sensitive.

As regards the irritation of the glands with a needle the results were entirely negative both in the morning and evening, though it is possible some sensitiveness might have been shown if the experiment had been tried during the noonday heat.

The meagre notes of a traveller made during a single day's observation are of course neither so full nor reliable as might be obtained by one living on the spot and with time at command. I believe further and accurate observations of the habits and functions of this very curious plant would be well repaid by the interesting results obtained.

A KEY TO THE HIGHER ALGÆ OF THE ATLANTIC COAST, BETWEEN NEWFOUNDLAND AND FLORIDA.

BY PROF. D. S. JORDAN.

In the preparation of this Key, the principal work of which use has been made is Prof. W. H. Harvey's Nereis Boreali-Americana. The characters of the higher groups have been to a great extent copied or abridged from that work, and Harvey's Nomenclature and arrangement of families have been generally followed. In several instances, doubtful species have been suppressed or omitted.

Although the number of species recognized by Harvey is much less than has been admitted by previous writers, a still further reduction would be an advantage. Perhaps one-sixth of the species described in the Nereis might with propriety be considered as varieties.

The author has tried to render the Key as simple, compact and easy of comprehension as possible. Obvious characters, wherever available, have been used in preference to technical ones, as the structures on which the classification is really based are microscopic and often hard to ascertain.

Special technical terms are generally avoided, and those not used in Gray's "Manual of Botany" are defined where they occur.

Among plants so little known and which vary so widely as the Algæ, a synoptical table by which any specimen in any condition may be identified, is, of course, impossible, but it is hoped that this Key is sufficiently plain and accurate that nine specimens in every ten may be readily classified by its aid.

SUB-CLASS I. MELANOSPERMEÆ.

(OLIVE-GREEN ALGÆ).

Plants olive-green or olive-brown, never showing tints of red. Fructification monœcious or diœcious. Spores olive-colored, either external or contained singly or in groups in proper concep-

tacles; each spore enveloped in a pellucid skin, simple or finally separating into two, four or eight sporules. Antheridia, or transparent cells filled with orange-colored, vivacious corpuscles, moving by means of vibratile cilia.

Marine, often of large size, mostly between tide marks, **A**

A. FROND LEATHERY OR MEMBRANACEOUS, FORMING A COMPACT CELLULAR SUBSTANCE, ... **B**

A. FROND OF JOINTED FILAMENTS WHICH ARE EITHER FREE OR UNITED IN A COMPOUND BODY, ... **C**

B. *Spores in spherical cavities in the frond; air vessels commonly present; large, tough plants,* . FUCACEÆ. **D**

B. *Spores in indefinite cloud-like patches on the surface of the frond, which is usually large and stipitate, sometimes deeply divided, but never truly branched,* LAMINARIACEÆ. **F**

B. *Spores attached to external jointed filaments; ours, slender deep water species becoming blackish-green in drying,* . . . . . SPOROCHNACEÆ. **E**

B. *Spores in definite groups (sori) on the surface of the frond; fronds smallish, juiceless, the surface netted with small cells,* . . . . . DICTYOTACEÆ. **H**

C. *Spores immersed; fronds not jointed, except in a few small parasites in which the filaments are connected at base,* . . . . . CHORDARIACEÆ. **K**

C. *Spores external; fronds either obviously jointed or else surrounded by whorled branchlets,* ECTOCARPACEÆ. **N**

D. Frond leafy; air vessels stalked separate, ... *Sargassum.* **Q**
D. Frond leaf-like below; air vessels in terminal branchlets, pod-like, several celled, ... *Halidrys.* **T**
D. Frond dichotomous; receptacles filled with mucous; air vessels, if present, not as above, ... *Fucus.* **U**
E. Frond slender, with whorls of delicate filaments at the nodes, *Arthocladia.* **X**
E. Frond pinnate, solid, ... *Desmarestia.* **Y**
F. Frond flat, with a midvein, ... **G**
F. Frond flat, without a midvein, ... *Laminaria.* **Z**

F. Frond cylindrical, septate within, ... *Chorda.* e
G. Frond pierced with large roundish holes, ... *Agarum.* d
G. Frond not pierced with holes, ... *Alaria.* c
H. Frond branching, ... J
H. Frond simple, ... I
I. Frond flat, without midvein, ... *Punctaria.* i
I. Frond bag-like, or worm-like, not constricted, . . *Asperococcus.* k
J. Dichotomous, with wide axils, ... *Stilophora.* f
J. Stem mostly excurrent with many long branches, . *Dictyosiphon.* g
J. Frond tubular; branches opposite, tapering to each end, *Striaria.* h
K. Frond cylindrical, branching, ... L
K. Small or minute parasites composed of densely tufted filaments connected at base, free above, ... M
K. Frond tuber-shaped, irregular, ... *Leathesia.* n
L. Axis cartilaginous, dense; filaments of periphery unbranched; long, slender species . . . . . *Chordaria.* l
L. Axis gelatinous, lax; peripheral filaments branched. *Mesogloia.* m
M. Tufts on Fucus; ¼ to 1 inch high, ... *Elachista.* o
M. Forming minute brown patches on Ulva, etc., . *Myrionema.* p
N. Frond rigid; each joint of numerous cells, ... O
N. Frond soft; each joint of a single cell, ... P
O. Stems not obviously jointed; branchlets whorled, *Cladostephus.* q
O. Whole frond articulate; pinnately branched, . . *Sphacelaria.* r
P. Frond capillary, much branched, ... *Ectocarpus.* s
P. Frond simple, with clusters of small branchlets, . *Myriotrichia.* x
Q. Air vessels tipped with filiform points. . . . . S
Q. Air vessels nearly or quite pointless. . . . . R
R. Leaves glandular; air vessels not longer than their pedicels. . 1
R. Leaves nearly glandless; pedicels very short. 4
S. Leaves narrow, repand or sub-entire. 2
S. Leaves broader, sharply serrate. 3
T. Frond compressed, repeatedly pinnate. 5
U. Frond flat, with a midrib. V
U. Frond compressed, without a midrib. 6
V. Air vessels usually present; coarse species more common than the next. 7
V. No air vessels; frond serrate. 10
V. No air vessels; margins entire. . . . . W
W. Receptacles obtuse; northern. 8
W. Receptacles acute; river mouths, etc. 9
X. Young stems villous; deep water; rare. 11
Y. Frond cylindrical; branches opposite. 12
Y. Branches flattish, alternate, either with tufts of bright green filaments, or subulate spines. 13
Z. Frond undivided, or cleft only at apex. . . . . a
Z. Frond finally deeply cleft. . . . . b
a. Stipe very long, hollow, largest midway; deep water. 17

a. Stipe short, cylindrical, solid; margin of frond wavy or ruffled; very large. 14
a. Stipe flat, winged; frond very long, narrow. 16
a. Stipe short, flattened; much smaller and more delicate than the preceding huge "oar-weeds" and "tangles." 18
b. Stipe nearly round, 1 to 6 feet long; common. 15
b. Stipe flat, 3 to 4 inches long; rare. 19
c. Frond pinnatifid below, with veinless leaflets. 20
d. Rocks, etc., below low tide; common N. 21
e. Frond constricted at intervals, 1 to 2 feet long. 23
e. Frond not constricted, 1 to 40 feet long. 22
f. Adhering strongly to paper; rare. 24
g. On stones, Fucus, Chordaria, etc.; common. 25
h. Fruit — groups of spores in transverse lines. 26
i. Frond tapering each way; 1 to 4 lines wide. 27
i. Frond an inch or more wide. . . . . j
j. Dark green; attenuate to base. 28
j. Pale; abruptly tapering to base. 29
k. Fruit — minute, scattered dot-like sori. 30
l. Frond with long, filiform, sub-simple branches. 31
l. Irregularly, mostly dichotomously branched. 32
m. Slender, with a few short branches; on Zostera. 35
m. Clumsy with long worm-like branches. 33
m. Filiform; branches long; branchlets short; axils wide. . . . 34
n. On Corallina, etc.; tuber size of a walnut or less, becoming finally hollow. 36
o. Brown pencil-like tufts on the common Fuci. 37
p. Several species probably here; the commonest is 38
q. Branches slender; branchlets forked, regularly whorled. . . . 39
q. Coarser, branchlets simple, irregularly whorled. 40
r. In globose tufts on small Algæ. 41
r. In spreading patches on rocks and sand. 42
s. Branches mostly opposite or in fours. . . . . t
s. Branches mostly alternate. . . . . u
t. Propagula (pod-like bodies regarded as the fructification, which are formed by partial or entire transformation of a branch) elliptical, sessile. 48
t. Propagula forming swellings in the lesser branches. 43
u. Joints of stem decidedly longer than broad. . . . . w
u. Joints of stem not longer than broad. v
v. Zigzag, much forked; small spine-like branchlets at nearly every joint. 51
v. Stem excurrent; propagula elliptical; branches erect. 49
v. Propagula elongated; our commonest Ectocarpus. 44
w. Propagula linear, tipped with points formed in the ultimate branchlets. 45
w. Tufts sponge-like, densely interwoven. 46

w. Branches with short, remote, horizontal, spine-like branchlets. **52**
w. Not as above; long, loose and feathery. **50**
x. On Chorda, Dictyosiphon, etc. Stem flexuous. **53**

LIST OF SPECIES.

In the following list the distribution of each plant is given, as far as known. The figures refer to the average height of the plant in inches.

1. SARGASSUM* VULGARE Agardh (*Sea-Lentils*). Cape Cod and South. 12–36.
2. SARGASSUM MONTAGNEI Bailey. Rhode Island and South. 12–30.
3. SARGASSUM BACCIFERUM Agardh. (*Sea-grapes, Gulf-weed.*) Gulf Stream. 12–40.
4. SARGASSUM HYSTRIX Agardh. Gulf Stream. 12–20.
5. HALIDRYS SILICULOSA Lyngby. Newfoundland. 10–50.
6. FUCUS NODOSUS Linnæus. New York and North. 10–50.
7. FUCUS VESCICULOSUS Linnæus. New Jersey and North. 6–30.
8. FUCUS FURCATUS Agardh. Newfoundland. 12–20.
9. FUCUS CERANOIDES Linnæus. New York. 10–25.
10. FUCUS SERRATUS Linnæus. Massachusetts and North. 24–40.
11. ARTHOCLADIA VILLOSA Duby. North Carolina. 6–35.
12. DESMARESTIA VIRIDIS Lamoroux. New York and North. 12–36.
13. DESMARESTIA ACULEATA Lamoroux. New Jersey and North. 12–80.
14. LAMINARIA SACCHARINA Lamoroux. (*Venus' Girdle.*) Cape May and N. 12–120.
15. LAMINARIA DIGITATA Linnæus (*Oar-weed*). Long Island and North. 40–144.
16. LAMINARIA LOREA Bory. Newfoundland. 24–60.
17. LAMINARIA LONGICRURIS De la Pylaie. Rhode Island and North. 60–100.
18. LAMINARIA FASCIA Agardh. New Jersey and North. 2–12.
19. LAMINARIA DERMATODEA De la Pylaie. Newfoundland. 50.
20. ALARIA ESCULENTA Greville (*Badderlocks*). Cape Cod and North. 36–250.
21. AGARUM TURNERI Postels and Ruprecht (*Sea Colander*). Cape Cod and N. 50–160.
22. CHORDA FILUM Stack. (*Lucky Minny's Lines*). Cape May and North. 15–500.
23. CHORDA LOMENTARIA Lyngby. Charleston and North. 8–18.
24. STILOPHORA RHIZODES Agardh. New Jersey and North. 4–5.
25. DICTYOSIPHON FŒNICULACEUS† Greville. New Jersey and North. 6–24.
26. STRIARIA ATTENUATA Greville. New York. 2–3.
27. PUNCTARIA TENUISSIMA Greville. New Jersey and North. 2–10.
28. PUNCTARIA PLANTAGINEA Greville. Cape Cod and North. 6–12.
29. PUNCTARIA LATIFOLIA Greville. New Jersey and North. 8–12.
30. ASPEROCOCCUS ECHINATUS Greville. Massachusetts. 5–24.
31. CHORDARIA FLAGELLIFORMIS Agardh. New Jersey and North. 12–24.
32. CHORDARIA DIVARICATA Agardh. Long Island and North. 12–30.
33. MESOGLOIA VERMICULARIS Agardh. Halifax. 12–18.

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*More than 120 species of Sargassum have been described, many of them being distinguished by indefinite or inconstant characters. Prof. Agassiz, who had given this group some special attention, expressed his decided opinion that our eight or ten American "species" were merely forms or varieties of one and the same plant. Specimens with blended characters of Nos. 1 and 2 are not uncommon.

†In the AMERICAN NATURALIST for August, 1873, notice is given of a discovery of mine of a specimen of DICTYOSIPHON FŒNICULACEUS growing on CHORDARIA FLAGELLIFORMIS not as a parasite, but as a branch of the same plant. Unless there was some mistake, either in observation or in identification, this would show, as was believed long ago by Areschoug, that Dictyosiphon is merely an abnormal state of *Chordaria flagelliformis*.

34. MESOGLOIA VIRESCENS Carmichael. Massachusetts and South. 2–12.
35. MESOGLOIA ZOSTERÆ Areschoug. Halifax. 6–8.
36. LEATHESIA TUBERIFORMIS Gray. Whole Coast. ½–1½.
37. ELACHISTA FUCICOLA Fries. Whole Coast. 1 or less.
38. MYRIONEMA STRANGULANS Greville. Coast. One-tenth.
39. CLADOSTEPHUS VERTICILLATUS Agardh. Long Island and North. 3–8.
40. CLADOSTEPHUS SPONGIOSUS Agardh. Long Island and North. 2–5.
41. SPHACELARIA CIRRHOSA Agardh. New York and North. 1–2.
42. SPHACELARIA RADICANS Dillwen. Massachusetts. ½.
43. ECTOCARPUS BRACHIATUS Harvey. Massachusetts and North. 2–4.
44. ECTOCARPUS LITTORALIS Lyngby. Virginia and North. 6–12.
45. ECTOCARPUS SILICULOSUS Lyngby. Whole Coast. 3–6.
46. ECTOCARPUS TOMENTOSUS Lyngby. Massachusetts and North. 2–6.
47. ECTOCARPUS FASCICULATUS Harvey. New Jersey to Massachusetts. 3–6.
48. ECTOCARPUS GRANULOSUS Agardh. Massachusetts. 4–8.
49. ECTOCARPUS DURKEEI Agardh. New Hampshire. ——. 2.
50. ECTOCARPUS MITCHELLÆ Harvey. Nantucket. 2–3.
51. ECTOCARPUS LANDSBURGI Harvey. Nova Scotia. 1–2.
52. ECTOCARPUS HOOPERI Harvey. New York (?). 3–8.
53. MYRIOTRICHIA FILIFORMIS Griffiths. Maine. 1–2.

HUMAN REMAINS IN THE SHELL HEAPS OF THE ST. JOHN'S RIVER, EAST FLORIDA. CANNIBALISM.*

BY PROF. J. WYMAN.

AFTER repeated examinations of the more important shell heaps on the St. John's, we have failed to find any evidence that they were used for the burial of the dead, or for any other purpose than dwelling places. Human bones have, however, been discovered in them, from time to time, under peculiar circumstances, and as their presence opens a question of much interest, it will be desirable to describe in detail each of the instances in which they have been detected, especially where the bones have been found in considerable numbers.

1. The first which came under the notice of the writer, was at Old Enterprise, on Lake Monroe, in 1861, a few rods above the high bluff and near the shore of the lake. The deposit of shells where the bones were found is about four feet thick, and has been much washed away by the waves during the great storms. While making an excavation near the roots of a large palmetto tree

*We are permitted to print this paper in advance from the "Sixth Annual Report of the Peabody Museum of Anthropology," now in press.—EDS.

which had been partially uncovered by the action of the water, human bones were found about two feet below the surface. A foot above them, where a fire had been made, were ashes and large pieces of oak charcoal. The bones were not burned, however, and did not appear to have been connected with the fire in any way. They were broken into pieces a few inches long, just as was the case with the bones of the deer from the same deposit, or from the adjoining bluff, and like them had lost their organic matter, were incrusted with lime, and had become cemented together, so as in all respects to have the appearance of the same age as the bones of the animals associated with them.

The fragments consisted of the head of a femur broken off just below the lesser trochanter, two fragments of the shaft of this bone, one fragment each of the shaft of the tibia, fibula and humerus, a part of a scapula, including the glenoid portion, two metatarsal bones, and one phalanx of a thumb. It is quite probable that there were originally a larger number of pieces and that many had been carried away by the action of the water in its encroachments on the shore.

Two important and more complete discoveries were made in the neighborhood of Blue Spring, though the localities were somewhat over two miles apart.

2. One of these was on the left bank of the creek through which the spring discharges, and about thirty feet from its union with the river. The bones were found about two feet below the surface, embedded in the shells, and represented a large part of the bones of the skeleton. They were nearly all more or less broken, and were scattered about without any definite order. Many fragments of the skull, however, were found near together. Besides the pieces of the cranium, there were fragments of the following bones: viz., the lower jaw, right and left clavicle, right humerus, right and left scapula, ulna of both sides, right radius, right and left femur, right tibia, the two patellæ, upper end of the sternum, one fragment of pelvis, many fragments of ribs and a few bones of hands and feet. The humerus, radius and tibia of the left side were not found.

3. The other collection is from a low oval mound, in the swamp or meadow, two miles in a northerly direction from Blue Spring. Here, again, portions of many parts of the skeleton were present. Notwithstanding careful search beyond the limits where the bones

were discovered, not a single piece of the head was found. Of eleven vertebræ found, all except one (the fifth lumbar) had their arches detached, as if for removing the spinal cord. The right innominate bone was broken into four pieces; of the left only one large, including the acetabulum, and a few small pieces remained. The right femur was broken into three and the left into five pieces; the left radius and left ulna each into three pieces, the left humerus into two, and the head of it was missing. All the bones of the right arm and right leg below the knee were missing. There were many fragments of ribs. The different pieces were scattered about over a surface of four or five square yards and promiscuously mingled. The bones had not been previously disturbed.

Near these remains were found some fragments of a large earthen vessel, apparently capable of holding several gallons, and varying from a half to three-quarters of an inch in thickness. The bones had lost all their organic matter, and when struck against each other have a decided ring.

4. A small collection of human bones was found in a shell field a few hundred feet south of the mouth of the creek at Blue Spring, and near the river. They consisted of fragments of the humerus, tibia, lower jaw, scapula and ulna, broken in the same manner as those just described, and also bones of the hands and feet. As the field in which they were discovered had been ploughed, it is uncertain to what extent the breaking of them may have been accidental. The appearances were the same as in the bones already described. There were no signs of a burial place.

5. Many fragments of an imperfect human skeleton were found in the mound on Huntoon Island, and near Huntoon creek. They were covered with shells to the depth of eighteen inches, and though the place was completely explored, only the following were discovered; viz., fragments of a skull, an imperfect lower jaw, pieces of the right and left thigh bones, a piece of an upper arm bone, some fragments of the forearm and leg, and a few joints of fingers and toes. The bones were all of a diminutive size, evidently those of a dwarf. Basing an estimate on the proportions of the thigh bones to the whole skeleton, the individual is supposed to have been about three feet and a half high. The angles and articular processes of the lower jaw were broken off and the molar teeth had nearly all disappeared during life, and their

alveoli had been absorbed. These facts indicate an individual which was, at the least, adult. Forty feet from the place where these bones were found, a large tree had been overturned, and among the shells carried up by the roots, was found a human ankle bone (an astragalus), but a careful search brought to light nothing else, in this direction, belonging to man.

6. A single fragment of a human upper jaw of the right side, was found in the large shell heap on the same island and near the river buried to the depth of six or seven feet, and could have been deposited there only at the time the mound was built. An upper arm bone, whole, parts of the lower jaw, and a few fragments of other bones, were discovered in the débris at the base of the same mound where it had been undermined, but the precise place from which they had fallen is uncertain.

7. In the remnant of a mound, three-quarters of a mile below Hawkinsville and on the left bank, human bones were found, about a foot deep, in a layer of shells not more than two feet thick. They appeared to be of the same age as the shells in which they were embedded, and were all broken, and much scattered, a proof that they had not been buried. A second deposit was found twenty-five feet from the preceding, the bones were somewhat incrusted with lime, and were more decomposed. There were from the first locality seven fragments of cranium, two of the left humerus, two of the left clavicle, one of the right ulna, one fragment each of the right and left tibia and several small pieces of other bones. The shore where both these sets were found had been undermined and it is probable that many pieces had been washed away.

8. Excavations made on the side of Bartram's Mound near the river, and where it had been undermined, brought to light numerous pieces of human bones all belonging to one skeleton. There were eighteen fragments of cranium, the right half of the lower jaw, the teeth of which had nearly all been lost and their alveoli absorbed, and thirty fragments of other bones including those of a femur, humerus, radius, tibia, fibula, and a patella. All of these appeared to have been covered for a long time, had lost nearly all their organic matter and were incrusted with a thin layer of calcareous deposit. It is quite likely that here too some of the bones originally deposited had been washed away by the river, as the mound at this point had been largely destroyed. In

several instances the cranial bones were broken into small fragments and were irregularly cemented together by the deposit of lime.

9. A large block of consolidated shells split from the front of Osceola Mound left exposed a portion of a human skull. In detaching this, other bones were brought to view and excavations were continued until no further traces could be discovered. The chief part of the bones were removed in a mass of conglomerate and subsequently exposed by chiselling away the matrix, but from which they have not been wholly detached. The organic matter has entirely disappeared and the matrix adheres so firmly to the bones, that it is very difficult to separate it without at the same time breaking off pieces of bony structure.

Of all the human remains we have met with in the shell mounds these last are the most interesting, both on account of their greater age and of their being almost the only ones which can, with any certainty, be referred to the earliest period of the mounds. Osceola mound is one of the series in which pottery is not found, and its materials, as well as the mound as a whole, have undergone great changes.

There are certainly bones from two individuals, mingled. Two thigh bones, which are mates, lie side by side, but in reversed positions, the upper part of one corresponding with the lower of the other. The articular portions are gone. Parts of at least two others were found, one of which was removed nearly whole. Of the other there are two cylindrical portions, one 55 and the other 90^{mm} long. The exposed ends of the shorter one show the interesting fact that the bone had been artificially divided, by cutting a groove around the circumference of the bone and thus weakening it and then breaking the remainder. This is a common method of dividing bones used by Indians. The broken surface and the marks of the cutting instrument are quite obvious. In the longer piece these marks are present but less distinct. As further evidence of the presence of bones from two individuals, may be mentioned the lower ends of two upper arm bones, both from the right side and of different sizes, and both cemented together. There are three tibiæ, two of which are decidedly flattened and belonged to the same individual, the third having more nearly the triangular section, but only slightly flattened.

Besides the above there are fragments of a scapula, pelvis,

humerus, radius, tibia, ribs, tarsal and carpal bones and phalanges. There are but few pieces of ribs, and but a single vertebra has been recognized.

The different bones were artificially broken in a few cases only, and contrasted very strongly in this respect with those previously noticed.

We have met with but a single other instance where human bones have shown signs of having been wrought by the aborigines. This was in the coast shell heap at Ipswich, Massachusetts, where Mr. Eliot Cabot discovered a human upper arm bone, which, as shown by the lines and marks on the surface had been ground or scraped. The nature of this instrument found is uncertain, as the end has been broken off. It is preserved in the Peabody Museum.

10. At Huntoon Island, and in the rear of the shell mound on the St. John's, are two conical mounds, and are supposed to be burial mounds, one fifteen and the other twenty-five feet high. Excavations carried to the depth of six feet, but arrested at this depth on account of our inability to get the necessary labor, did not, however, reveal any evidence of burial in either of them. A collection of human bones was obtained from the top of the larger of them at the depth of about a foot below the surface, which in all respects correspond with those previously described. They were scattered over an area of several square yards and belonged to a young individual as shown by the size of the bones and the condition of the epiphyses. Each of the long bones was broken into two or more, and the skull into many, fragments. Pieces were found from all the principal divisions of the skeleton. There can be no doubt that the bones were intentionally broken, as the upper ends of two humeri show precisely similar marks of violence. In each case the bone is broken off an inch below the head, by an instrument which crushed the bone, the fragments of which, flattened down, are retained in opposition, not having been originally completely separated. The bones are all incrusted with a calcareous deposit, which in some cases cements the fragments, and others the smaller bones, as of the hands, together. Their condition is similar to that of the bones from Bartram's Mound already described.

The above are the chief instances of the presence of human remains in the shell mounds which have fallen under our notice. They are not supposed to be the only ones which existed, for they

were all but one chance discoveries. In all but a single instance there was nothing to direct attention to one place rather than another in making excavations, and as these were begun at random it is all but certain that many others escaped detection.

It would perhaps be going too far to say that the presence of human bones, under the circumstances above described, amounted to absolute proof of cannibalism. The testimony of eye-witnesses would be the only sure evidence of it. There is, however, nothing with regard to them which is inconsistent with this practice, nor does any other explanation occur to us which accounts for their presence so well.*

If there were any eye-witnesses of cannibalism among the Europeans who explored Florida in the earliest days of its history, they have left no records of the fact. In later times Jonathan Dickenson, a Pennsylvania quaker, who was wrecked on the coast near St. Lucia in 1699, in the narrative of his sufferings, calls the inhabitants cannibals, but nowhere saw human flesh eaten by them. The most direct statement he makes is as follows: "at this town about a twelve-month before a parcel of Dutch men were killed, who having been cast away on the Bohemia (Bahama) Shoals, they, in a flatt which they built, escaped hither and were devoured by these cannibals, as we understand by the Spaniards."† I am indebted to Dr. C. F. Winslow for a statement in the records of Nantucket that Capt. Christopher Hussey "was cast away on the Florida coast and devoured by cannibals." This event was also in the latter part of the seventeenth century.‡

The reasons derived from our own observations for believing

* A statement by Le Moyne would at first sight seem to suggest another explanation. The natives when first seen by the French had the habit of dismembering the bodies of their slain enemies and carrying off the scalps and limbs as trophies. Plate XVI represents a celebration in which these are hung up on stakes and around which a ceremony is going on. While such a custom might account for the presence of human bones in the shell heaps, it would not for the fragmentary condition in which these are found, nor for the systematic manner in which all the bones of the limbs, as well as of the other parts of the skeleton, are broken up. In addition it may be stated that for reasons we have given elsewhere there is some doubt whether the Indians who built the shell mounds were the same as those found when the Europeans arrived in Florida, and consequently a practice prevailing among the latter might not exist among the former.

† God's Protecting Providence, Man's direct Help and Defence, etc., p. 60, 8vo. London, 1700.

‡ See doings of the Nantucket Historico-genealogical Society, in Nantucket Inquirer and Mirror. Nov. 22, 1873.

that the ancient inhabitants of the St. John's were cannibals may be stated as follows:

1. The bones, an account of which has just been given, were not deposited there at an ordinary burial of a dead body. In this case after the decay of the flesh there would have remained a certain order in the position of the parts of the skeleton, especially in the pelvis, the long bones of the limbs, the vertebral column and the head. The bones would be entire as in other burials. In the cases here described, they were, on the contrary, scattered in a disorderly manner, broken into many fragments, and often some important portions were missing, as the head at one of the mounds near Blue Spring, the bones of an arm and leg at the other, and in other mounds a still larger number of bones. The fractures as well as the disorder in which the bones were found evidently existed at the time they were covered up, as is shown by the condition of the broken ends, which had the same discoloration as the natural surfaces.

2. The bones were broken as in the case of those of edible animals, as the deer, alligator, etc. This would be necessary to reduce the parts to a size corresponding with the vessels in which they were cooked, or suitable for roasting, or even for eating raw.

3. The breaking up of the bones had a certain amount of method; the heads of the humerus and femur were detached as if to avoid the trouble, or from ignorance as to the way, of disarticulating the joints. The shafts of these bones, as also those of the forearm and leg, were regularly broken through the middle. The olecranon process of the ulna, was in some cases detached in the same manner as the corresponding part has been found to be in the deer.

4. There is no evidence that the bones were broken up while lying exposed upon the ground by wild animals, as the wolves and bears. If they were thus broken one might reasonably expect to find the marks of teeth, but after a careful examination of hundreds of pieces they have not been seen in a single instance. As a general rule dogs, and the same is true of wolves, gnaw chiefly the ends of the bones, which are of a soft and spongy texture, leaving the shaft, which is solid and unyielding almost intact, or at any rate to the last. This is the case even with the bones of birds, which are so much smaller. In the bones from

the mounds the spongy ends show no marks of teeth and are well preserved though detached from the shaft.

The conclusion we have given is strengthened by the fact that cannibalism prevailed largely in both North and South America, and that the natives of America were led to it by the same motives as were those of other parts of the world. In general this practice may be said to commend itself to the savage mind from the following considerations:—

With some it was a matter of choice, depending upon a liking for human flesh as an article of food, as with the Fijians, who had not even the excuse growing out of a scarcity, for food of all kinds existed with them in greatest abundance. With others, and these are by far the most numerous, it was practised as an act of vengeance or triumph over a fallen foe, and with still others it may be said to have been of the nature of a superstitious rite or ceremony, as with the ancient Mexicans, the Miamis, and others. To the above should be added the pressure of extreme hunger, which drives both savage and civilized man to this terrible alternative.

Of starvation nothing need be said, except that it is not improbable that the idea of eating human flesh as ordinary food, may, perhaps, have had its origin in eating it as a necessity. Once tasted and found to be good, as all cannibals aver that it is, under the influence of savage instincts and passions, the conversion of an enemy's flesh into meat to eat would be very natural.

Of course the above motives, excluding the last, may be more or less combined, and a savage by eating his enemy may get his revenge and satisfy his appetite at the same time. Or, as with the New Zealander, who loves human flesh as a choice food, and who also eats it under the superstitious belief that he thus not only incorporates the body of his enemy with his own, but absorbs also his enemy's soul, so that ever after the two are one. To the victors this had an especial significance, for believing in a future state and the presence of his enemy there, if he eats him in this life he makes sure of it that there will be no trouble with him hereafter, for he possesses him body and soul already.

In the cannibalism as practised in the two Americas, one recognizes the same motives and tendencies and often combined with them, in addition, a degree of cruelty to their victims unsurpassed in other parts of the world.

The degraded and brutal inhabitants of Tierra del Fuego, in their fearful struggle for existence, with the elements on the one hand, and savage foes and scarcity of food on the other, would seem to be almost naturally led to the practice of eating human flesh. Capt. Fitzroy has given a sad picture of these poor, wretched creatures, living on the very verge of regions just capable of sustaining life. They habitually eat their prisoners of war, and in severe winters, when snow and ice cut off their usual supply of food, the old women are sacrificed without hesitation. Having choked and smothered them over a dense smoke, they eat them to the last scrap. The life of the dog, however, is spared under these circumstances, as he can render efficient aid in hunting, which the old women cannot.*

Of the prevalence of cannibalism in Guiana, there is evidence from various sources. The histories printed by De Bry † are full of particulars of the manner in which the bodies of victims are prepared, cooked and eaten. Pizarro and his companions, in their first but fruitless attempts to reach Peru from Panama, came suddenly upon an Indian village, when the inhabitants instantly fled leaving human flesh cooking before the fire.‡ We have the authority of Humboldt for its existence on the Orinoco at the time he travelled there.§ Brett found what he was undoubtedly correct in considering the remains of a cannibal feast in an ancient shell heap.‖ The Mexicans practised cannibalism on a most extensive scale on certain occasions. A prisoner was delivered to the warrior who had taken him in battle, and by him after being dressed was served at an entertainment of his friends. "This," says Prescott, "was not the coarse repast of famished cannibals, but a banquet teeming with delicious beverages and delicate viands, prepared with art and attended by both sexes, who conducted themselves with all the decorum of civilized life."¶

There were other kinds of victims. As is well known, human sacrifices formed a very important part of the religion of the ancient Mexicans. Their war god was constantly honored with

* Voyage of Adventure and Beagle. Vol. ii, pp. 183 and 189.

† See De Bry's narratives — Brazil, Voyage of Joannes Stadius, Hessus, pp. 71, 81, 89, 126 and 127; also voyage of Joannes Lerus, Burgundus, p. 213.

‡ Prescott, History of the Conquest of Peru. London, Bentley, 1854. p. 96.

§ Personal Narrative. Bohn's edition. Vol. ii, pp. 354, 411–415.

‖ Rev. J. G. Wood. Uncivilized Races in All Countries of the World. London, 1870. Vol. ii. p. 602.

¶ Prescott, History Conquest Mexico. Philadelphia, 1874. Vol. i, p. 81.

them, and the companions of Cortez saw large piles of the skulls of those who had been sacrificed. On such occasions, after the heart had been cut with an obsidian knife from the living victim, it was offered to the sun and then to the god, the body was thrown down the teocalli and afterwards divided and eaten. The native allies of the Spaniards, in the siege of Mexico, ate the bodies of their dead enemy.* In the city of Mexico itself, as the siege was prolonged and food became scarce, the number of victims first sacrificed to propitiate the god of war in hope of relief, then served out as food to the starving people, was very large. These sacrifices were often made in the sight of the Spaniards, who sometimes recognized the lighter skin of their countrymen as they wound their way up to the sacrificial stone to be in turn distributed as food among the besieged. †

Of all the American cannibals the Caribs undoubtedly had a stronger love for human flesh than any others, and not only ate their enemies taken in battle as a matter of revenge as well as gratification, but, like the Fijians, even fattened their prisoners for the cook-house that they might make better and more palatable food.‡ It was also practised among the Iroquois, Algonquins, Mamis and Kickapoos; § it existed in Louisiana, ‖ Illinois, and on the northwest coast. The most precise narratives we have of this practice are, however, to be found among the 'relations' of the Jesuits who were often eye-witnesses of the feasts of human flesh held by the Iroquois and Algonquin tribes.

One shudders with horror at the prolonged tortures which preceded death and the feast among these savage people. Every device cruelty could suggest was practised. Long before death, sometimes days, torture began. Burning brands were applied to the naked skin, nails were bitten from the fingers, and flesh from the limbs, gashes were cut in the arms and legs and hot brands thrust into them; the scalp was stripped from the head and live coals and hot ashes poured upon the bleeding surface. Women and children joined in these fiendish atrocities, and when at length the victim yielded up his life, his heart, if he were brave, was

* Ibid., Vol. iii, p. 132.

† Ibid., p. 153.

‡ Peter Martyr. Decade i, L. I., folio 2, A.

§ See notes of Hon. Lewis Cass to Ontwa the son of the Forest, a poem by Henry Whiting. New York, 1822, p. 129.

‖ Father Hennepin. Description de la Louisiane, Paris, 1868. pp. 65, 68, 69.

ripped from his body, cut in pieces, broiled, and given to the young men under the belief that it would increase their courage; they drank his blood, thinking it would make them more wary, and finally his body was divided limb from limb, roasted or thrown into the seething pot, and hands and feet, arms and legs, head and trunk, were all stewed into a horrid mess, and eaten amidst yells, songs and dances.*

Much more might be added but enough has been said for our purpose, viz: to show that cannibalism being so common in other parts of America, there would be no improbability of its existence in Florida. We have entered more into details than we otherwise should because the subject of American cannibalism has not received the attention it deserves. Mr. Francis Parkman is almost the only one who has taken the trouble to call attention to the documentary evidence which exists bearing upon it, and I am largely indebted to his writings and to himself personally for references to original statements.

THE HISTORY OF THE LOBSTER.

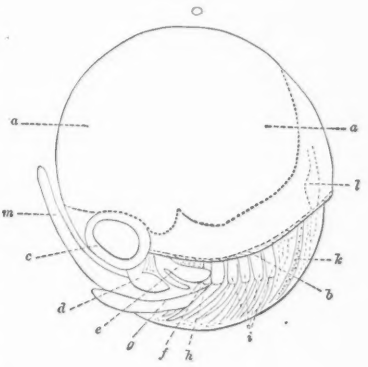
At length we have in a paper by Mr. S. I. Smith, assistant in the Sheffield Scientific School, New Haven, a careful history of the changes undergone by our native lobster, with valuable information on the season of breeding, and other facts of practical interest. The lobster, so important as an article of diet, is dying out from overfishing, and the time may come when it will have to be artificially raised. The information afforded by Mr. Smith is a result of the comprehensive views of Professor Baird, U. S. Commissioner of fisheries, who, besides his own laborious inquiries into the condition and prospects of our fisheries, has called to his aid many naturalists, who have by their special researches, with the aid of the vessels and apparatus afforded by government,

*For a justification of this picture of savagery the reader is referred to La Potherie, Hist. de l' Amerique. Paris, 1722, p. 23. Relation of Barthelemy de Vimout, 1642, p. 46. Relation of Jean Brebeuf, July 1636, p. 121. Relation of Francois Joseph Le Mercier. June, 1637, p. 118. Relation of Vimout, 1644, p. 41.

thrown much light on the natural history of our fishes and their food.

The following is an abstract (often in the author's own words) of Mr. Smith's paper, which appeared late during 1873, in the Transactions of the Connecticut Academy (vol. ii) and in part in the appendix to the report of the U. S. Fish Commissioner, lately issued. The season at which the female lobsters carry eggs varies much on different parts of the coast. Mr. Smith states that lobsters from New London and Stonington, Conn., are with eggs in April and May, while at Halifax he found them with eggs, in which the embryos were just beginning to develop, early in September. We have seen them in Salem with the embryos ready to hatch in the middle of May, and are told by Mr. J. H. Emerton, that they also breed here in November. It is not impossible that they breed at intervals throughout the year. This is an important point. At any rate there should be a close time on the coast of New England, during April and May, and October and November. Persons should also be fined heavily for selling lobsters with eggs attached.

Fig. 81.



The appearance of the embryo in the egg is represented by fig. 81.* He divides the larval condition of the lobster into three stages. The first, represented on plate 3, figs. A, B (D one of the cephalothoracic legs of the second pair, enlarged 20 diameters; *a*, exopodus; *b*, epipodus; *c*, branchial appendages), is a little under a third of an inch long, and was found early in July at

* Embryo, some time before hatching, removed from the external envelope and shown in a side view, enlarged 20 diameters; *a*, *a*, dark green yolk mass still unabsorbed; *b*, lateral margin of the carapax marked with many dendritic spots of red pigment; *c*, eye, *d*, antennula; *e*, antenna; *f*, external maxilliped; *g*, great cheliped which forms the big claw of the adult; *h*, outer swimming branch or exopodus of the same; *i*, the four ambulatory legs with their exopodal branches; *k*, intestine; *l*, heart; *m*, bilobed tail seen edgewise.

Wood's Hole, Mass. In the second stage, the animal has increased in size, and rudimentary appendages have appeared upon the second to the fifth segments of the abdomen.

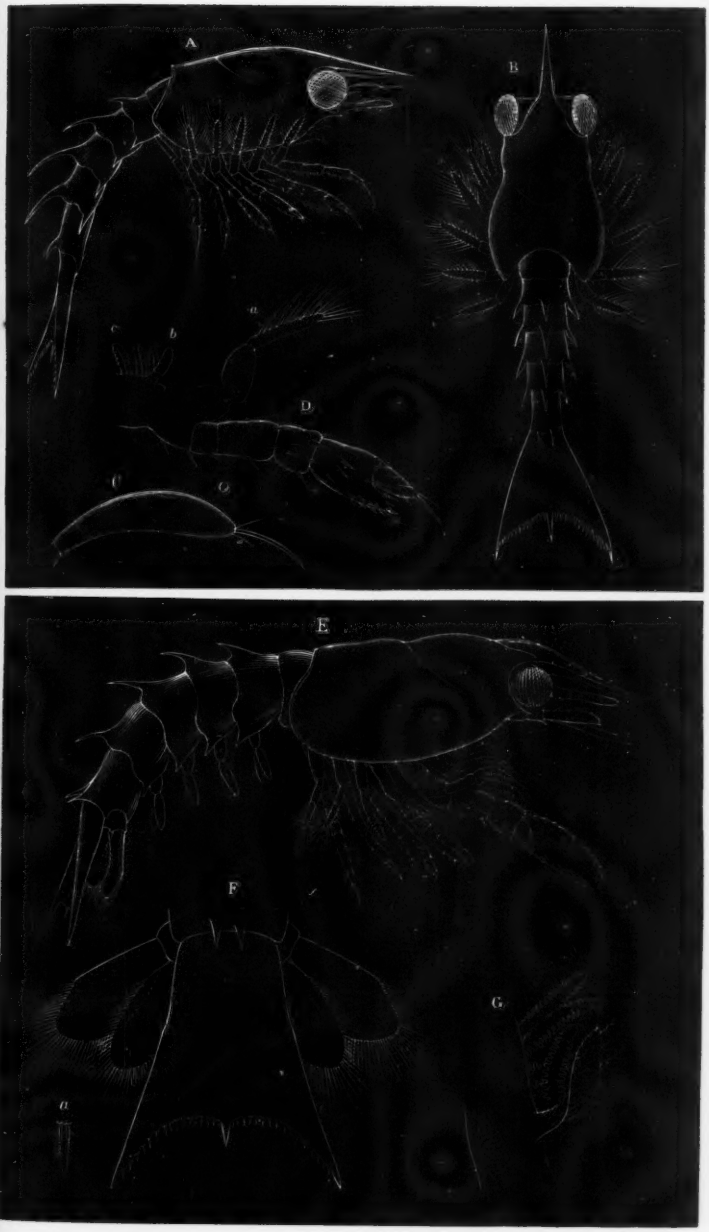
In the third stage* the animal is about half an inch long, and has begun to lose its Mysis-like (Schizopodal) appearance and to assume some of the features of the adult.

There are probably two succeeding stages before the adult form is attained, one is described by our author, while the first of the two he supposes to have existed, but has not yet discovered. After this the animal ceases to swim on the surface and late in summer seeks the bottom. They feed on the young of various animals, the larvæ of their crustacea, and, when much crowded in captivity, on one another, the stronger devouring the weaker. In the first stage of the adult form when the animal is about three-fifths of an inch long, it still differs from the adult so much that it would be regarded as a distinct genus. "In this stage, the young lobsters swim very rapidly by means of the abdominal legs, and dart backwards, when disturbed with the caudal appendages, frequently jumping out of the water in this way like shrimp which their movements in the water much resemble. They appear to live a large part of the time at the surface, as in the earlier stages, and were often seen swimming about among other surface animals. They were frequently taken from the 8th to the 28th of July, and very likely occur much later." Mr. Smith thinks the young pass through all the stages he describes in the course of a single season. Those in the last stage mentioned he believes had not been hatched from the eggs more than six weeks and very likely a shorter time. How long the young retain their free swimming habit after arriving at the lobster-like form, was not ascertained.

Specimens three inches in length have acquired nearly all the characters of the adult. The description of the different stages are very detailed, and accompanied by admirable figures.

"Of all the larval stages of other genera of crustacea of which I have seen figures or descriptions, there are none which are closely allied to the early stages of the lobster. Astacus, according to Rathke, leaves the egg in a form closely resembling the adult, the

*(Pl. 3, fig. *E*, larva enlarged eight diameter. *F*, terminal portion of the abdomen seen from above, enlarged 15 diameters; *a*, one of the small spines of the posterior margin of the terminal segments, enlarged 75 diameters; *G*, basal portion of one of the cephalothoracic legs of the second pair, showing the epipodus and branchial appendages, enlarged 20 diameters.)



EARLY STAGES OF THE LOBSTER.

cephalothoracic legs having no exopodal branches and the abdominal legs being already developed. Of the early stages of the numerous other genera of Astacidea and Thalassinidea scarcely anything is known, but as far as is known, none of them appear to approach the larvæ of the lobster. Most of the species of Crangonidæ and Palæmonidæ (among the most typical of macrourans), of which the development is known, are hatched from the egg in the zoëa stage, in which the five posterior pairs of cephalothoracic appendages, or decapodal legs, are wholly wanting, as are also the abdominal legs, while the two anterior pairs of maxillipeds, or all of them, are developed into locomotive organs. In no period of their development do they have all the decapodal legs furnished with natatory exopodal branches. There are undoubtedly larval forms closely allied to those of Homarus in some of the groups of Macrourans, although they appear to be as yet unknown.

"Notwithstanding these larval forms of the lobster seem to have no close affinities with the known larvæ of other genera of macrourans, they do show in many characters a very remarkable and interesting approach to the adult Schizopoda, particularly to the Mysidæ. This appears to me to furnish additional evidence that the Schizopods are only degraded macrourans much more closely allied to the Sergestidæ than to the Squilloidea."

The mode of moulting of the lobster, does not seem to have been observed. We are indebted to Mr. William H. Silsbee for information and specimens regarding that of the adult lobster. He thinks it only moults once a year after having nearly attained its maturity at some period between May and November. On November 8th he saw one moult. It drew its body out of a rent in the carapace, or shell covering the front division of the body. The carapace splits from its hind edge as far as the base of the rostrum, or beak, where it is too solid to separate. The body is drawn out of the anterior part of the carapace. It has been a question how the creature could draw its big claw out through the small basal joints. The claw, soft and fleshy and very watery, is drawn out through the basal joint, without any split in the old crust. In moulting, the stomach, with the cartilaginous masses and bands and œsophagus, is cast off with the old integument. The length of the animal observed before moulting was six and a half inches; immediately after seven and a quarter, a sudden increase in length of three-quarters of an inch.—A. S. P.

REVIEWS AND BOOK NOTICES.

FIELD ORNITHOLOGY.*— So much depends upon accurate and thorough field-work that ornithologists will heartily thank Dr. Coues for his excellent "Manual of Instruction," for it contains just the hints, if followed, to give the highest value to the work of the collector. Poorly prepared skins are unsightly enough, and indeed, a genuine eye-sore in cabinets, but if accompanied by detailed notes of date and locality, with a further record of sex and measurements, they have a far higher scientific value than if in themselves without blemish, but lacked these essential items of information. In this small volume of one hundred and sixteen pages, Dr. Coues has treated the general subject of collecting in a very detailed and highly satisfactory manner, his varied experience in the field, and his knowledge of what constitutes good working material, fitting him eminently for the task he has here attempted. Beginning with the selection and care of guns, ammunition and general equipments, he treats in the following chapters of how, where and when to seek for birds, and of how to handle and carry them when obtained; of note-taking, labelling and measuring, determining sex, etc.; of the preparation of bird-skins, with directions also for mounting; for collecting and preserving nests and eggs, making cabinets, and guarding collections against insect pests, etc. Assuming the reader's total ignorance of the subject, he adopts an easy, familiar style, with here and there a raciness that relieves the tediousness of the details which necessarily go to make up works of this class.

In respect to one point, however, we beg leave to differ from our accomplished author, and that is in respect to *baking skins* to rid them of insect pests. The process is undoubtedly thoroughly efficacious as regards the destruction of the insects, but, what is also of some importance, the baking nearly ruins the skins, rendering them extremely fragile. Bird skins, however, seem to suffer much less by this process than mammal skins, which baking once or twice is usually sufficient to utterly ruin,

* Field Ornithology. Comprising a Manual of Instruction for procuring, preparing, and preserving Birds, and a Check List of North American Birds. By Dr. Elliott Coues, U. S. A. Salem: Naturalists' Agency. Boston: Estes & Lauriat. New York: Dodd & Mead, 1874.

sometimes causing them to fall almost in pieces of their own weight. The present writer, although having had the care of one of the largest collections of skins in this county for over ten years, has never yet found it necessary to bake a skin to rid it of insects, having accomplished it by other means. Drenching a skin in the best quality of benzine is far preferable to baking, but this is objectionable from its sometimes (generally only after several applications) leaving a sticky residuum on the plumage. A better process is that of thorough fumigation with the bi-sulphide of carbon, which may be accomplished without the offensiveness of the fumes being very apparent by using a tight fumigating box or chest made expressly for this purpose.

The "Check List," though bound with the Manual, is essentially a distinct publication, being also issued separately. It is intended for use in labelling collections, and is hence printed on only one side of the paper. The two together form a supplement to the Key, of which they were originally intended to form a part. The "Check List" is a publication of more importance than to some its name might seem to imply. It is based, the author tells us, on the Key, and "reflects exactly whatever of truth or error that work represents." It differs quite materially from the Smithsonian Check List, published in 1858, as it very naturally should, in order to properly represent the present state of ornithological science in this country. Its greatest modification pertains, perhaps, to the system of nomenclature itself, through the introduction of varietal names. This, the recent advances in American ornithology have rendered imperatively necessary for the proper recognition of the numerous intergrading forms which result from different conditions of environment. But, aside from this, the present list differs from the former in containing much fewer generic names; in embracing some fifty species added to the North American fauna since 1858, and in the exclusion of about 150 of the specific names of the former list, from their being "extralimital, invalid or otherwise untenable," though a large proportion of them still appear in the varietal designations. As already indicated, the "Check List" is a reproduction of the names used in the Key, with, however, the addition of authorities for both the specific and varietal names, including not only the name of the describer of the species or variety, but also the authority for the present association of the names in question. It also includes

a number of species and varieties published since the appearance of the Key, the list being brought down to April of the present year. In his preface the author alludes to the "many needless and burdensome generic names," unfortunately adopted in Prof. Baird's great work, "for," he adds, "sanctioned by the usage of such high authority, they have passed current, and are too closely ingrained in our nomenclature to be soon eradicated." This, however, only represents one of the phases through which our science has passed, and which was not wholly without redeeming features, however true it may be that the time has come for us to rid ourselves of such now useless relics. During the publication of the Key, Dr. Coues instituted this needed reform, but too late for its systematic application throughout the class. The land birds were hence left in this respect unchanged, while in the generic names of the waders and swimmers we were carried back again to the days of Audubon, the genera adopted being essentially those of his Synopsis. The publication of the "Check List" seemed to present a favorable opportunity for a similar restriction among the land birds, which our author has failed to improve. It is hence a matter of regret that he has rigidly adhered to the Key, instead of departing from it sufficiently to have given us a consistent system of generic names throughout.—J. A. A.

THE BUTTERFLIES OF NORTH AMERICA.*—The success (in every way but a pecuniary one) of the first series of this admirable work, has led to the publication of a second. This will not be strictly confined to the descriptions and delineations of new species, but the metamorphoses of species before described will be given, a much more important matter than the description and illustration of new species, unless accompanied by life histories. The plates of this new part are thoroughly well done; a little more attention, however, to the drawing of the larvæ and pupæ would add to the perfect accuracy of the figures devoted to them, though the faults we perceive in one or two cases, *i. e.* an indistinctness of outline of the body and its parts, may be due to the printer. We wish the pages could be numbered, for ease in future reference. The text is lucid and interesting, the plates are not inferior to the best ever published in Europe, and the work is in every way a

*The Butterflies of North America, with colored drawings and descriptions. By W. H. Edwards. Second Series, Part I. New York: Hurd and Houghton. May, 1874. 4to, pp. 18 and 5 colored plates. $2.50 a part.

credit to the country. It is an admirable presentation book, either for young entomologists, or as an attractive serial for the drawing-room table.

Deep Sea Floridan Polyzoa.*—This elaborate treatment of the Polyzoa of the Floridan channel is based on the deep sea dredging made by Count Pourtalés of the U. S. Coast Survey. The geographical distribution of the forms found at the greatest depths in the channel, is of high interest as the assemblage embraced not only well known arctic but also antarctic, and even Australian species, with those purely tropical. The collection affords, as Dr. Smitt states, "new confirmation to the geographical theory first and most clearly stated by Prof. S. Lovén, that the deep sea fauna is a uniform one, connecting the north pole with the south through species of animals distinguished by their strong vital force, and, therefore, also by their great geological age." Several cretaceous, and a number of tertiary (European, Australian and Californian) species are recorded as now living in the Floridan seas.

The Publications of the Buffalo Society of Natural Sciences.†—The fourth and last number of the first volume of the "Bulletin" of this society is a capital one if we consider either the number and variety of the papers, the excellence of the illustrations, or the promptness with which the parts are issued. The publication is indeed a great credit to the city of Buffalo, and evinces the interest felt in scientific studies by the citizens. Several entomological papers are contributed by Mr. Grote, the curator of articulates and chairman of the publication committee, by Mr. Scudder, Mr. H. K. Morrison, Dr. L. F. Harvey, and Dr. LeConte; two paleontological articles are prepared by Mr. R. Rathburn and W. H. Pitt. The Contributions to the Geology and Physical Geography of the Lower Amazons, by Prof. C. F. Hartt, is a paper of so much general interest that we shall notice it at length hereafter.

List of North American Noctuid Moths.‡—Mr. Grote has before supplied entomologists with a catalogue of our Sphingidæ,

* Floridan Bryozoa, collected by Count L. F. de Pourtalés. Described by F. A. Smitt. Parts 1, 2, with 18 plates (Transactions of the Royal Swedish Academy of Science) 1872-3.) 4to, pp. 20, 83. Printed in the English language.

† Bulletin of the Buffalo Society of Natural Sciences. Buffalo, N. Y. Vol. i. 8vo, pp. 289, with 11 plates and woodcuts. 1873-4.

‡ List of the Noctuidæ of North America. By Aug. R. Grote, Buffalo, N. Y., May, 1874. 8vo, pp. 77, with colored plate.

Zygænidæ and Bombycidæ, and now we have an admirably prepared list of the next extensive family, the Noctuidæ. No other list has been published since the imperfect one contained in Dr. Morris' Catalogue of our Lepidoptera published by the Smithsonian Institution in 1860.

The species enumerated by Mr. Grote amount to 815, belonging to 282 genera, including the Deltoids (Hypena and allies) which the author, following Lederer, takes out of the Pyralidæ. Though it is not stated in the preface, the list is evidently restricted to that part of the continent north of the West Indies and Mexico. The most important synonyms are given, with an index to the genera. The appendix contains a number of new genera and species, illustrated in part by an excellent plate. The distribution of the genera is given; we wish that the localities of all the species separately could have been added.

BOTANY.

Geographical Distribution of the Cupuliferæ.—This large family, including the chestnuts, oaks, and beeches, since it is the earliest geologically of the dicotyledonous plants, affords much promise of definite conclusions in regard to the genetic relations of the present species from a comparison of the living and fossil forms. The first results of an extended investigation in this direction, by A. S. Orsted, in which the morphology, classification and geographical distribution of the family, are treated has been published in the transactions of the Copenhagen Academy. The conclusions in regard to geographical distribution harmonize with the generally received law, that the more the classification of a family rests on characteristics which indicate a real relationship, the clearer it appears, that each subdivision has its own centre of distribution, and further that the greater the differences of organization between the subdivisions, the greater the geographical distances between these centres. Thus the chestnuts, oaks and beeches, constituting the three groups of this family, afford three principal centres of distribution, and cover three large, widely separated geographical regions; the chestnuts having their centre in the Malay islands, the oaks in Mexico, and the beeches in South America. The chestnut group, which is sharply separated from the other groups, also has its own peculiar, tolerably well defined

region, manifesting its greatest diversity of form, and its purest types on the Malay islands, especially on Java and Sumatra, where its proper centre lies. But one species passes its boundaries toward the west, and plays an important part around the Mediterranean, and three species are found in America, whilst the typical genus is found exclusively on the Malay islands, where only a few species of chestnut-oak are found, and not a single true oak. In a similar manner the oak group occurs chiefly in America, north of the equator, forming a second centre of distribution in the mountains of Mexico, where it manifests not only more numerous species but also greater diversity of organization, than anywhere else, several large subdivisions being found that are not met with elsewhere, whilst chestnuts and beeches are entirely wanting. Although the beech group exhibits such a preponderance of species in Chili, that that country must be regarded as its proper home, still the species are so scattered that it is difficult, with the present distribution of land and water, to refer all to a single centre. This difficulty is not so great, however, in regard to *Nothofagus*, which occurs in New Zealand and Van Dieman's Land, since there are other grounds for assuming that these were at one period connected with Chili. Still it seems impossible to refer the species of *Fagus* to the same centre, since the nearest related species is separated by 70° of latitude from the beeches of the south, so that, paradoxical as it may appear, Japan seems once to have formed the connection between the beeches of the north and south, just as we find points of contact between Chili and Japan in other respects. An explanation of this is afforded by the fact that the beeches of Japan conform to those of the Miocene epoch; the centre of distribution of the typical beeches must therefore be sought in a past geological period, and from it they must have been dispersed in different directions, before the present distribution of land and water. Besides the three principal centres alluded to, there are also three secondary centres of distribution characterized by peculiar genera and sub-genera. The principal groups in passing beyond their respective regions, and mingling with each other have produced regions of transition, in which forms appear which are the connecting links between the types from the different centres. Various facts in regard to the distribution of plants in general are also peculiarly illustrated by this family. Thus it exhibits most clearly the marked difference between the

floras of Mexico and the Antilles, the oaks being more numerous in Mexico than any other portion of the world, whilst they are wholly wanting in the Antilles, although the latter afford climatic conditions favorable to their growth in many places. This contrast, can be partially explained, as regards the oaks, by the fact that the seeds of the latter soon lose their power of germination, and are not easily transported by currents; and besides the oaks occur in the mountainous regions of Mexico, remote from the sea, and even if the seeds were transported by the aid of rivers, they would not find conditions favorable to their development on the coast of the Antilles, a fact in harmony with the general rule, that the larger number of the plants common to the Antilles and the continent belong to the lowlands of the tropics, whilst the plants of the mountains are generally endemic. The distribution of the cupuliferæ also substantiates, in a remarkable manner, the general rule that the floras richest in endemic species are those where the physical obstructions to diffusion of plants are greatest, the ocean, high snow-covered mountain ranges, especially those with their axes perpendicular to the direction of the wind, forming sharply defined limits of floras. Thus whilst the white oak occurs all over Europe, the species of cupuliferæ in Sumatra and Java are entirely different from each other. In like manner the characteristic cupuliferæ of California are restricted to the western slope of the Nevada chain, and the beeches of Chili are entirely excluded from the east side of the snow-covered Cordilleras. This family also manifests the usual anomalies to the general rule, that the zone of vegetation becomes more elevated near the equator, caused by peculiarities in the form of the mountains, and the influence of clouds, a high plateau, with stronger insolation, producing a considerable elevation of the zone and the snow line, as in Bolivia, and Thibet, whilst abrupt, isolated peaks have a reverse effect. Thus Europe exhibits the influence of plateaus upon the cupuliferæ in two points, namely in the central part of the Alps, in the weaker development and the lowering of the zone of the beeches, whilst the pine and larch, to which a mountainous climate is very favorable, form a broad zone in Wallis and Granbünden, 500 to 1000 feet higher than in the Bavarian Alps. Again the chestnut zone, which reaches 5,000 feet on the Sierra Nevadas, which rest on the plateau of Grenada, does not rise above 3,200 feet in the same latitude, in Portugal. This is owing, it is true, in part to

peculiar climatic conditions, which produce an unusual depression of the zones in Portugal, and which also manifest themselves in rendering the zone of vegetation much lower in Sumatra than in Java, on account of the difference in insolation, caused by the more frequent and heavier clouds in Sumatra, where the axis of the mountains is perpendicular to the course of the moist, prevailing winds, whilst in Java it is parallel to it. In this respect Portugal resembles Sumatra, and nowhere are the effects of similar climatic conditions more evident than in the southern portions of Chili, and in Terra del Fuego.

Note on the Influence of Light on the Development of Plants.—Last summer a *Mentychia ornata*, about a fortnight before commencing to bloom, was prostrated by a storm and remained in that position for a week before I restored it to its upright position. The inflorescence of Mentychia is centrifugal, the terminal flower opening first and the rest in their order downward, each flower opening in the evening and closing before sunrise, reopening on a second and usually on a third evening. In this instance the regular order was disturbed, the second flower not opening till after the fourth, then the fifth to the eighth in order, then the twelfth followed by the eleventh, ninth and tenth, then the thirteenth followed by the sixteenth, fourteenth and fifteenth. All the retarded flowers were on the lower side of the prostrate plant, the retardation being the consequence of the diminished exposure to light during one week.—Fred. Brendel.

ZOOLOGY.

The Structure of Sponges.—An exceedingly valuable work on the calcareous sponges has lately been published by Professor Haeckel. An increased interest in these organisms has been felt from their frequent occurrence at great depths in the sea, the various dredging expeditions in the north Atlantic and the Mediterranean having revealed many new forms of the silicious, or glass sponges and their allies. Of the animal nature of sponges but few naturalists doubt. Carter, an English microscopist believed that the sponge was an aggregation of Amœba-like infusoria, living among a framework of silicious or limestone spicules. A little later, the lamented Professor H. J. Clark, of this country published, in 1866, a paper in which he maintained that the sponge

was an aggregation of flagellate infusoria, like monads of the genera *Monas*, *Anthophysa*, *Codosiga*, etc. The sponge, then, in his view was a compound protozoan animal. Now Haeckel contends that these monads of Clark are simply cells lining the general stomach-cavity of the sponge, each bearing a cilium or thread, and that the sponge is not a compound infusorian, but a much more highly organized animal related to the radiates, such as the Polyps (*Hydra*, etc.). He distinguishes in them a general cavity or stomach, the walls of which consist, as in the Acalephs, of two layers (entoderm and exoderm) of cells. He regards the sponges and Acalephæ as having been evolved from a common ancestor which he terms *Protascus*.

Since writing the foregoing lines we have received a paper by Metschnikoff on the development of a calcareous sponge (*Sycon ciliatum*). He clearly proves that Haeckel's view of the structure of the sponges was correct, but shows that there is no real relationship between the sponges and radiates.

Haeckel's Embryonal and Ancestral form of all Animals.— Regarding the sponges, then, as consisting of two layers of cells, surrounding a body cavity, somewhat as in the Hydra, Haeckel compares the sponge to the embryos of the higher animals, both vertebrate and invertebrate. In his view the germ of all animals, and the adult of such a simple form as Hydra, may be reduced to the simple form of the young of a calcareous sponge which he calls *Gastrula*. "The *Gastrula* I consider as the truest and most significant embryonal-form of the animal kingdom." It leads in his view to the sponges, to the Acalephæ, to the worms, to the echinoderms, to the mollusks, and to the vertebrates, through Amphioxus. Embryonal forms which may easily be traced from *Gastrula*, occur among the Arthropods (Crustacea as well as Insects). In all these representatives of different stocks of animals, the *Gastrula* always maintains the same structure. From this identity in form of the Gastrula with the representatives of the different animal stocks (or sub-kingdoms), from the sponges up to the vertebrates, he imagines an unknown stem-form of animals, typified by Gastrula, which he calls *Gastræa*.

Temperature and Life of the Arctic Ocean.—In Prof. Moebius' report on the Zoology of the Second German North-Polar Voyage (translated and abridged in the Annals and Magazine of

Natural History, March) it is stated that so slight are the oscillations of temperature in the polar sea above the parallel of 70°, (ranging between 32° and 36° Fahr.) that the marine animals of Greenland are in just as favorable a position as the animals of the tropical seas, where, as observed by Dana, and others more recently, the temperature of the surface and the bottom at 22 fathoms was identical.

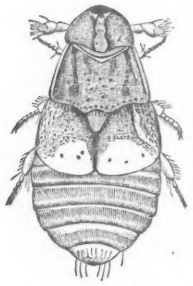
"I suppose that the nearly uniform temperature in which the high northern marine animals live is one of the chief causes of the considerable size by which, according to numerous observations, they are distinguished from individuals of the same species in temperate regions; for at the bottom of the icy sea, species which from their nature can thrive in a low temperature, are but little if at all exposed to those disturbances which the greater oscillations of temperature produce in the vital conditions of the animals of more temperate seas. The organs can consequently perform their functions in a more uniform manner (so far as these are dependent on temperature) than in individuals of the same species which inhabit, for example, the middle and higher regions of the North Sea and the Baltic, where the differences between the lowest and highest temperatures of the water amount to 10°–15° R. (=22°·5–33° ·75 F.), or sometimes even more, as has been ascertained by H. A. Meyer, for various points in the western basin of the Baltic, and by myself for two places in the North Sea off the German coast."

A Worm with External Ovaries.—In the same paper Prof. Moebius figures and describes a new genus of chætopod worms with external ovaries from the eighteenth segment onwards: they are situated below the branchiæ, and at the boundary between the two segments. Within the body-wall in the same segments are also eggs. The worm is named *Leipoceras uviferum*. It is the only worm known which has external ovaries. In a notice in the same journal it is stated that Moebius has discovered that another worm (*Scolecolepis cirrata* Sars) carries its eggs in pouches like a swallow's nest, along the hinder segments of the body. Many Polychætous worms bear their eggs in sacs attached to the ventral surface of the body (*e. g.*, *Autolycus prolifer* Müll.). One (*Syllis pulligera* Krohn) carries them in the shorter dorsal filaments of its feet, while in *Spirorbis spirillum*, the eggs are carried in folds of the skin, developed in the peduncle of the operculum, with which it closes its tube.

A remarkable Beetle Parasite of the Beaver.—Dr. LeConte describes, in the "Proceedings of the Zoological Society of

London," Nov. 5, 1872, a new family of Coleoptera under the term Platypsyllidæ, founded on *Platypsylla castoris* (Fig. 82), made known by Ritsema, who discovered it on specimens of the American beaver in the Zoological gardens of Amsterdam. A little later Prof. Westwood described it under the name of *Platypsyllus castorinus*, a singular coincidence as regards the scientific name. Ritsema regarded it as representing a family of the Aphaniptera, equivalent in value to the *Pulicidæ*, *i. e.*, dipterous. Westwood thought it to be a type of a new order of insects, the *Achreioptera*. Dr. LeConte, and we are fortunate in having in our country one who easily leads the ranks of Coleopterists, after a hasty examination, regarded the insect as coleopterous, a conclusion confirmed by further careful study, the results of which are presented in the beautiful paper before us.

Fig. 82.



Platypsylla castoris.

In this singular insect, the body is long oval, flattened, spiny on the exposed portions, resembling at first sight a minute cockroach, and of the same color. The wing covers are small, not longer than the prothorax, and the head is nearly semicircular, the eyes entirely wanting, the antennæ nine-jointed, clavate; the maxillæ large, with four-jointed palpi; the mentum large, the ligula broad, and the labial palpi short and three-jointed, while the labrum is peculiar. After comparing this beetle with those of other families, the author decides that "the affinities of this insect are very composite, but all in the direction of the Adephagous and Clavicorn series, though chiefly with the latter. The most convenient position of the family will probably be between Hydrophilidæ and Leptinidæ as the families are now arranged, though its tendency to Trichopterygidæ and Corylophidæ is equally strongly manifested. It is therefore a very peculiar and extraordinary synthetic type, which is almost equally in and out of place in any linear arrangement of the series with which it is allied."

As this parasite occurs on our native beaver we hope our naturalists will be on the lookout for specimens, and carefully examine the fur of these animals for that purpose.

TORNARIA NOT A LARVAL STARFISH, BUT THE YOUNG OF A WORM. — Mr. Alexander Agassiz has discovered that the Tornaria, an immature microscopic floating animal, which he in common with other naturalists had thought to be a young starfish, is really a young worm. The parent is a remarkable worm, found at different points on our coast and that of Europe, burrowing in sand, and described by the celebrated Italian zoologist Delle Chiaje. The history of Balanoglossus as given by Agassiz "while showing great analogy between the development of Echinoderms and the Nemertian worms, by no means proves the identity of type of the Echinoderms and Annuloids. It is undoubtedly the strongest case known which could be taken to prove their identity. But when we come carefully to analyze the anatomy of true Echinoderm larvæ, and compare it with that of Tornaria, we find that we leave as wide a gulf as ever between the structure of the Echinoderms and that of the Annuloids." Now the young of certain Echinoderms have a form very similar to larval worms. On this chiefly Prof. Huxley, misled by the names given by J. Müller to some of these larvæ has revived the old opinion of Oken, and associated the Echinoderms with the Articulates; but as he based his opinion entirely upon the figures of Müller, and not upon original investigations, his conclusions, which have been adopted by the majority of English naturalists, do not appear to Mr. Agassiz as tenable. "The hypothetical form to which Huxley reduces these larvæ, to make his comparisons and to draw his inferences, is one which has never been observed, and as far as we now know does not exist." His paper, with many beautiful figures, appears in the "Memoirs of the American Academy of Arts and Sciences."

THE WHITE-NECKED RAVEN. — This bird is seldom seen in the mountains at any period of the year, but during winter it is very common in the vicinity of Denver. As it is rarely molested, it has become so tame that it enters the gardens and streets in the quieter portions of the city and perches on the trees and fences, regarding the passers-by with more curiosity than fear. Like the eastern crow it is social in its habits, going in small parties of two or three up to ten or twenty; and in its general actions and appearance it closely resembles that bird. Its croak is thinner and shriller than that of *C. corax*, which is here seldom, if ever, found. On clear, warm afternoons during winter and early spring,

the white-necked raven sometimes ascends to considerable heights, and sails in slow, wide circles somewhat like the buzzard. In summer and fall it is by no means as tame and familiar as during the colder months of the year, and exhibits much of the peculiar cunning of the crow. It breeds in the timber along the stream; during summer I have never observed it in the mountains.

This species probably ranges all along the foot of the Rocky Mountains at least as far north as Wyoming, and extends to a considerable distance eastward over the plains. I have seen it at least a hundred miles east of Denver. I venture to suggest that its range will be found to join that of *C. Americanus* on the east, and that of *C. corax* on the north, being thus the southwestern representative of the genus.—T. Martin Trippe, *Denver, Col.*

Relation of the Cœlenterates and Echinoderms.—At the close of an important paper entitled "Studies on the Development of the Medusæ and Siphonophora" in a late number of Siebold and Kœlliker's Zeitschrift Metschnikoff, a Russian zoologist, thus expresses his views as to the affinities of the Cœlenterates and Echinoderms drawn from a study of the larvæ of the two types.

"In conclusion I will again affirm that I regard the Cœlenterates and Echinoderms as two different types, but which have so many relatives on both sides, that they should always be placed next to each other in the system. I think that between the two there is the same grade of similarity as between the higher worms (Hirudinea, Gephyrea and Annelides) and the Arthropods (Insects and Crustacea). In order to be assured of this, we must observe the bearings of embryological facts, and in regard to the Cœlenterates and Echinoderms not forgot, that the body-cavity and peritoneal cavity represent two different things." This is opposed to the view which Huxley and some German naturalists entertain as to the affinities of the Echinoderms, placing them next to the worms and breaking up the type of radiates (which view is fashionable just at present in Europe;) and confirmatory of the views of those who adhere to the Cuvierian type of Radiates.

New Carboniferous Myriopods from Nova Scotia. — It will be remembered that Dr. J. W. Dawson of Montreal discovered the remains of a galley worm or millepede in a stump of Sigillaria, which flourished during the early part of the Coal period of Nova Scotia. It occurred with a land shell, and in the

same precious stump occurred the fragments of six-footed insects preserved in the coprolites of the lizards that once ran up and down those trees. The fragments of galley worms were described by Dawson under the name of *Xylobius Sigillariæ*. On subjecting them to farther examination, Mr. Scudder finds there were in reality, portions of three other species of *Xylobius*, and a species of a new genus, which he also thinks should form the type of a new family. It is described in the "Memoirs of the Boston Society of Natural History," under the name of *Archiulus xylobioides*, and the family is called *Archiulidæ*. The insects found with them, but in too small pieces to be recognizable, belonged to the Orthoptera and Neuroptera.

The Discovery of the Origin of the Sting of the Bee.—In Siebold and Kölliker's "Journal of Scientific Zoology" for July, 1872, containing an account of the Proceedings of the Zoological division of the 3rd meeting of the Russian Association of Naturalists, at Kiew, is an abstract of a paper by Ouljanin on the development of the sting of the bee. The author describes but two pairs of imaginal disks, while three were discovered and described by the undersigned in 1866. The author homologizes the elements of the sting with the feet, as had already been done by me in 1871. Soon afterwards Dr. C. Kraepelin published an elaborate article on the structure, mechanism and developmental history of the sting of the bee. In speaking of the origin of the sting (p. 320, vol. 23, 1873), he only refers to Ganin's observations made in vol. 19, of the same journal (1869). Dr. Kraepelin seems to have overlooked the writers' papers* on the origin of the sting of the bee and ovipositor of other insects (Æschna and Agrion) published in 1866 and 1868, the observations and drawings having been made in 1863.—A. S. Packard, Jr.

Deep sea Dredgings in the Gulf of St. Lawrence.—Mr. J. F. Whiteaves records in the March number of the "American

* Observations on the Development and Position of the Hymenoptera, with notes on the Morphology of Insects, Proceedings Boston Society N. H., published May, 1866. On the structure of the Ovipositor and Homologous parts in the male Insect. Proceedings Boston Society, N. H. vol. xi, published in 1868. Guide to the Study of Insects, 1869, pp. 14, 536. Embryological Studies on Diplax, Perithemis, and the Thysanurous genus Isotoma. Memoirs Peabody Academy of Science, 1871, p. 20. Here the spring of the Poduridæ is homologized with a pair of blades of the ovipositor of the bee, etc., and the ovipositor regarded as homologous with the spinnerets of spiders and abdominal feet of myriopods.

Journal of Science" the occurrence of the following recent additions to the American fauna, in depths of from 200 to 220 fathoms; of sponges, *Trichostemma hemisphericum* M. Sars, and *Cladorhiza abyssicola* M. Sars, with *Hyalonema longissimum;* of echinoderms, *Ophioscolex glacialis;* of polyzoa, *Flustra abyssicola* G. O. Sars, and *Escharella palmata* Sars; of shells, *Portlandia lucida*, *P. frigida*, *Cylichna umbilicata* and *Cerithiopsis costulata;* of crustacea, *Calocaris MacAndreæ* Bell, *Munidopsis curvirostra*, a new genus and species, allied to *Munida; Pseudomma roseum* G. O. Sars, *Halirages fulvocinctus* Bœck, *Munnopsis typica* Sars, and several other species. Numerous interesting species, many of them new to the American coast, were also dredged in shallower water, on the Orphan and Bradelle Banks, and at the entrance of Gaspé Bay. Among the crustacea from these localities were *Leucon nasicus* Kroyer, *Acanthostephia Malmgreni* Bœck, *Œdiceros lynceus*, and *Aceros phyllonyx* Bœck.

The Mouth Parts of the Dragon Fly.—An important article on the mouth parts of the dragon fly, Perlæ and allied forms (*Orthoptera amphibiotica*), is published by Dr. Gerstaecker, in the memorial volume of the Centennial Celebration of the Society of the Friends of Science in Berlin, 1873. The author describes and figures the palpi of the dragon flies. They possess a one-jointed maxillary palpus, and 2-jointed labial palpus, which are not however in the maxillæ palpiform, but constitute a simple lobe (galea of Burmeister, Erichson and Ratzburg). In Hagen's "Synopsis of Neuroptera of North America" (1861) it is stated "mouth not furnished with palpi." This statement, which is morphologically inexact, was copied in the "Guide to the Study of Insects." It will be corrected in the fifth edition of the latter, as it was unfortunately too late to correct the statement in the fourth edition, now passing through the press, except in a few words in the preface.—A. S. P.

A New Type of Snakes.—I have recently described a snake from the Amazonian region of Peru, in which the spines of the dorsal vertebræ are so dilated at the summit as to present a series of bony plates along the middle line of the back, homologous with the central pieces of the shield of a tortoise. The species presented other peculiarities and was called *Genhosteus prosopis*. It was discovered by Prof. James Orton.—E. D. C.

NOTICE OF A SPECIES OF TERN NEW TO THE ATLANTIC COAST OF NORTH AMERICA.—During the last summer Mr. Franklin Benner of New York, while a member of Prof. Baird's Fish Commission party at Peak's Island, Portland Harbor, Maine, obtained a fine specimen of a species of tern which approaches very near to the characters of the *Sterna longipennis* Nordmann, or *Sterna Pikei* Lawrence, although it differs in several particulars from the descriptions of this species. The specimen was presented by Mr. Benner to the National Museum, in which it is numbered 64,394. It may be described as follows:—

Portland Harbor, Me., July, 1873. Adult, summer plumage?: head, neck, lower part of the rump, upper tail coverts, tail and entire lower parts snow white, the former with a black patch covering the occipital region and surrounding the eye. Mantle, wings, and outer webs of tail feathers pale pearly ash, deeper on the primaries, the outer web of the outer quill and that of the outer tail feathers, dark slate color. Bill and feet, uniform deep black. Wing, 9·60; tail, outer feather, 6·00, middle, 3·40; culmen, 1·15; depth of bill at the base, ·30; tarsus, ·55; middle toe, ·60.

Upon consulting the description of *S. Pikei* Lawr., in the ninth volume of the "Pacific Railroad Reports" (page 863), it will be seen that that species, or at least the type, has a dark-red bill and orange-colored legs. The description of *S. longipennis* Nordmann (in Coues' Key, p. 320), with which Dr. Coues considers *S. Pikei* to be identical, says the bill of that species is "black, or reddish-black, the point often whitish," but makes no mention of the color of the feet. The bird obtained at Portland has both the bill and feet uniform deep black. In view of the fact that it seems to correspond in general dimensions and colors of the plumage with *S. longipennis*, I have concluded to refer it to that species. This bird is in adult summer dress, yet the whole forehead and lores back to the posterior portion of the crown is immaculate white. It is, however, possible that the autumnal plumage was put on prematurely. In the event this bird should prove distinct from *S. longipennis*, I propose for it the name *Sterna Portlandica*.—ROBERT RIDGWAY.

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THE RUDDY DUCK.—On the 10th Sept., 1873, I was greatly surprised at finding two immature specimens of *Erismatura rubida* hanging up with a bunch of winter and summer yellow

legs in a game stall in Quincy market, Boston. They had been sent from Cape Cod, Mass., the day previous, where they were said to have been shot. They were apparently not more than six weeks old and as their wings were not fledged enough to fly a rod, they undoubtedly must have been hatched in that locality.

This is indeed a very eastern range for this species to have bred, as I believe its usual breeding habitat is in the region of the Rocky Mts. Dr. Elliott Coues writes me "I found the ruddy duck breeding abundantly in July, in ponds on Turtle Mt., exactly on the line of the 49th parallel, between Dakota and the British Possessions, about 150 miles west of Pembina (Red River of the North). I obtained many newly hatched young; eggs were laid in June. This is the only breeding place of this species, of which I am aware by personal investigation."

We have a large migration of this duck through eastern Massachusetts in October and November, which would indicate that they must also breed more directly north of our state, though possibly many may follow the chain of great lakes and St. Lawrence River to the Atlantic states.

I obtained one of the above specimens which I have in my cabinet, and I have no reason to doubt that these birds were taken on Cape Cod.

I have seen specimens, taken as far east as Niagara Falls in May; these were in high breeding plumage, though I did not learn that any nests had ever been found in that locality. — Ruthven Deane, *Cambridge, Mass.*

Birds new to the Fauna of North America. — The Gyrfalcon of Northern Europe and Siberia (*Falco gyrfalco* Linn.) has recently been obtained at Kyska Harbor, one of the western Aleutians, by Mr. W. H. Dall, exploring that region under the auspices of the U. S. Coast Survey. The specimen is an adult female, in perfect plumage, obtained June 30, 1873. On the label are the remarks "eye brown," and "builds." The measurements of this specimen are as follows: — wing, 14·75; tail, 8·00; culmen, ·95; tarsus, 2·30; middle toe, 2·05. The ground color of the upper parts is a very dark blackish plumbeous, the posterior portions, *i. e.*, the rump and upper tail-coverts (and more indistinctly the scapulars and wing-coverts), transversely barred with light bluish plumbeous. The head and neck, however, are entirely uniform

plumbeous black, except on the throat. The lower parts are, *everywhere*, including the under surface of the wings, marked with broad transverse bars of plumbeous-black, the two colors about equal in amount; the jugulum, and even the throat, with conspicuous, heavy, drop-shaped longitudinal markings of blackish.

This is the first capture of the Scandinavian, or true, gyrfalcon in North America, and the fact that it breeds in the Aleutians warrants its introduction into the nearctic fauna.

Numenius femoralis Peale must also be added to the number of North American birds, a fine specimen having been obtained May 18, 1869, by Mr. Ferdinand Bischoff, naturalist to the overland telegraph expedition, under the direction of Col. C. S. Bulkley. It is now in the National Museum (No. 58,471 ♂).

This specimen has been compared with Sandwich Island examples, and found to be identical. The species is very different from any other North American one. — Robert Ridgway.

On some of the Evidences of Life in Great Salt Lake. — Dr. A. S. Packard, Jr., in his interesting remarks on "Insects inhabiting Great Salt Lake and other Saline or Alkaline Lakes in the West," as given in Dr. Hayden's last Report, very properly expresses the hope that some one will make a careful examination of the shores of the lake, and carefully preserve all traces of life which he may find there.

As I examined a portion of the eastern shore of the Great Salt Lake, last year, it may be of advantage to naturalists if I mention some of the evidences of life which I found there. Of course I found the flies, such as are seen by all who visit the lake in summer; the shore was almost literally black with them. They rose before us, but immediately settled down again upon the sands, close to the lake, when we had passed. Their larvæ, in the greatest abundance, were attached to the bottom, and to submerged sticks, close to the shore; and their pupa skins lay in piles on the shore. The little shrimp-like crustaceans (*Artemia fertilis*) were also seen in great profusion, and these were the most numerous, apparently, where the water was the saltest, as in portions partly shut off from the lake.

I collected a large number of shells on the shore of the lake, but did not interpret them as representing life in the lake; they are all, I believe, fresh-water forms. Besides these, I found two

fishes, each about a foot long, on the shore of the lake, which without doubt came from the lake itself; but whether they floated there from Lake Utah, or from some one of the rivers that empty into the lake, or whether they belong to Great Salt Lake itself, I do not know. But I have so much faith in finding fishes and other lower forms of life in Great Salt Lake itself, that I shall dredge the lake at my earliest opportunity. I observed water-birds on the lake in great numbers. — Sanborn Tenney, *Williams College, Nov.*, 1873.

[Prof. Tenney has kindly sent to the Academy, portions of one of the fishes mentioned above, and it proved to be a cyprinoid allied to the western chubs. It is more probable that this lover of pure water was washed into the lake from some tributary and died immediately, than that it was ever an inhabitant of the lake. There is also a possibility of its having been brought by fish-catching birds from a distance. It is known that pelicans and gulls breed on the island in the lake in immense numbers, and that they take long flights for the purpose of securing their food. — F. W. P.]

English Sparrows. — The apprehensions I expressed in my "Key" lest these birds should molest our native species as soon as they overflowed municipal limits has been verified already. Mr. Thomas G. Gentry writes to me:—"The sparrows introduced a few years ago in Germantown, Pa., have become quite common in the adjoining country, and are driving away the robins, bluebirds and sparrows. They increase so rapidly and are so pugnacious, that our smaller native birds are compelled to seek quarters elsewhere." I did not expect the bad news quite so soon. Probably it will not be long before we hear the same complaints from other places. I have always been opposed to the introduction of the birds, mainly on this score, but also for other reasons. There is no occasion for them in this country; the good they do in destroying certain insects has been overrated. I foresee the time when it will be deemed advisable to take measures to get rid of the birds, or at least to check their increase.—Elliott Coues.

A New Group of Cyprinidæ.—Prof. Cope has recently printed a paper in the "Proceedings of the American Philosophical Society" on the *Plagopterinæ*, a group of cyprinoid fishes characteristic of the hydrographic basin of western Colorado. The group differs

from all those related to it in the possession of five osseous spines of the ventral fins, and two closely united osseous spines in the front of the dorsal. In some of the species the remaining dorsal and some pectoral rays are simple and osseous for a large part of their length. In the osseous ventral rays this group resembles the extinct *Saurodontidæ* of the cretaceous period. Three genera were described, viz: *Plagopterus* Cope, with beards and no scales; *Meda* Girard, without either beards or scales; and *Lepidomeda* Cope, with scales and no beards. There are four species, three of which had been brought to light by the naturalists of Lieut. Wheeler's U. S. Survey, west of the 100th meridian.

A Horned Elotherium.—At a recent meeting of the American Philosophical Society I exhibited the greater part of the mandible of a large extinct hog of the genus Elotherium which had been described in the "Bulletin of Hayden's Geological Survey of the Territories" as *E. ramosum* Cope. The animal was as large as the Indian rhinoceros, and is peculiar in the possession of two osseous tuberosities on each side, the front pair standing on the chin and projecting into horns of much strength.—E. D. C.

The Skunk.—In the "American Journal of Science," for May, the Rev. H. C. Hovey has a very important and interesting article under the title of *Rabies Mephitica*, in which it is shown that the skunk can no longer be regarded as simply a very disagreeable animal, but on the contrary a most dangerous one, and is to be classed with the rattlesnake as an enemy to mankind. As strange as it may appear, Mr. Hovey has brought forward an array of facts to prove that the skunk is very often affected with a disease or perhaps with a natural salivary secretion, that causes its bite to be far more dreaded than that of the rattlesnake or of a mad dog. As the skunk is a nocturnal animal that steals upon his victim without warning and gives the bite which almost invariably proves fatal, it is truly to be dreaded; especially is this the case in the western states where the animal is abundant and many persons are nightly exposed to its attacks. We advise all to read the article and take warning.

The Redheaded Woodpecker in Maine (*Melanerpes erythrocephalus* Sw.).—This bird was shot in Orono last summer by a student of the Agricultural College. I have never before seen it in

Maine, and do not find it noticed in any lists of birds given for Maine, to which I have access, except in one published by the Portland Society of Natural History. I do not know from that list who found the bird, or in what part of the state it occurred. The bird may be common in this state but it is new to me in this region.—C. H. FERNALD.

MENOBRANCHUS EDIBLE.—Cayuga Lake (near Ithaca, central New York) abounds with the spotted Proteus, *Menobranchus maculatus* (perhaps a variety of *M. lateralis*, but never striped and always spotted). In preparing a paper upon their anatomy and embryology, Dr. W. S. Barnard and myself have occasion to use them in numbers; and a single fisherman, who sets many hooks for fish has brought us a hundred during the past month (March); he, and all others, apparently regard them as poisonous, and are rather averse to touching them; so far is this from the case, that they are absolutely harmless in every way; and on the 5th, Dr. Barnard and myself eat one which was cooked, and found it excellent; it is our intention to recommend it as food, but not until our investigations are concluded.—BURT G. WILDER.

NEW CRUSTACEA OF THE SWEDISH JOSEPHINE EXPEDITION.—The Norwegian naturalist G. O. Sars, the son of the celebrated zoologist, Professor Michael Sars, has worked up the species of Cumaceæ found by the Josephine expedition. They are little shrimp-like Crustaceans, some of which were found at great depths by the naturalists of the Swedish expedition which participated in the recent deep sea explorations with the dredge. As some of the species new to science are from near the coast of Long Island, the paper will be of interest to our American zoologists. The work is done in the most thorough manner, with admirably executed plates. It forms one of the memoirs of the Swedish Academy.

SPECIAL MODE OF DEVELOPMENT OF CERTAIN BATRACHIANS.—In a letter printed in the "Revue Scientifique," No. 37, 1873, M. Jules Garnier communicates some remarkable observations that have been made by M. Baray on certain Hylodes which exist in large numbers in the island of Guadaloupe. These animals are widely distributed over the island, being found not only near the sea, but in the higher lands of the interior, and after rain their croak makes the air resonant. The physical features of Guada-

loupe, a volcanic island, the soil of which is composed of tufa, pozzuolana and similar material, are so peculiar and so very unfavorable for the maintenance of tadpole life, which is essentially piscine, that M. Baray was led to expect the existence of some peculiarities of development. The ova were easily procured, as they were everywhere present under moist leaves. No tadpoles could be discovered, but many of the frogs were of an extraordinarily minute size. The eggs were spherical, with a diameter of from three to four millimetres, and were each provided with a small spheroidal expansion resembling a hernia of the gelatinous mass through a pore in the envelope. In the centre of the sphere the embryo was visible, lying on a vitelline mass of a dirty white color, and having a thin body, a large head and four styliform members with a recurved tail. When the egg was touched the embryo moved rapidly and changed its position. A day later the embryo was perfect, with a tail as long as the body, translucent and like that of a tadpole. The limbs immediately formed, and at the expiration of a few days little frogs of a dark grayish brown color, and *without a vestige of a tail*, escaped from the egg. M. Baray's observations have established the following facts: — 1. That this *Hylodes Martinicensis* commences life by a rotatory movement of the future embryo; 2. The fully formed embryo performs the rotatory movements more rapidly, but in a horizontal plane; 3. The branchiæ make their appearance, and again vanish sometime afterwards; 4. The larva in the ovum is provided with a tail and limbs; 5. The tail of the larva not only facilitates the movements of the imprisoned animal, but also aids respiration by the numerous and minute vessels which ramify in this highly developed appendage; 6. The animal issues from the egg in the form which it preserves throughout life. As M. Garnier observes, these observations seem to constitute a starting-point for a special investigation of great importance, and have a close relation to the question of the adaptability of species to surrounding conditions. It may be asked in this case whether the frog has been created with special modifications adapting it to live in an island destitute of marshes, or has it in course of time acquired a new mode of development enabling it to survive under the exceptional conditions under which it has been placed. — *The Academy.*

The Paleontological History of Trilobites, etc., as opposed by Barrande, to the Evolution Theory. — During the

year past, another large quarto volume on the trilobites, by M. Barrande, the distinguished paleontologist, has appeared, illustrated with numerous plates. The author strongly opposes, on paleontological grounds, the prevalent evolutional theories. His conclusions we present as briefly as possible; they are of great weight as coming from so experienced and able an observer. He thinks that there is no trace of a gradual improvement of the original type whatever in the entire series of the trilobites. In considering the fossil Crustacea of the earliest Silurian formation of Europe, he regards the coexistence of their principal types, such as the Phyllopodes, and the Ostracodes, with the trilobites of the primordial fauna, so well exhibited in England and Sweden, as constituting an important fact. "Indeed, among the positive facts of paleontology, there are none which would lead us to suppose that forms so contrasted, as we have just indicated, were derived from a common ancestry, by means of filiation or transformation. This descent is thus far a pure creation of the imagination." Again he says, "The great difference of structure which separates the type of trilobites and the types of these two orders (Ostracodes and Phyllopodes) carries us back to a very distant age before the Silurian primordial fauna, if we suppose, according to theory, that they were all derived from a common ancestry. This supposition will oblige us to admit that all the intermediate forms have invariably disappeared in all the countries of the globe, and in a long series of anteprimordial deposits, unknown up to this day." That this inexplicable disappearance, even if accounted for by future discoveries, would only give way to still more formidable facts opposed to evolution, Barrande thinks would be the case; and he goes on to say that the trilobites of the "second fauna" of the Lower Silurian rocks of Bohemia, make their first appearance, accompanied not only by two types of Ostracodes, Primitia and Beyrichia, but also with two types of Cirripedes, or barnacles, perfectly characterized, and which he calls Anatifopsis and Plumulites.

Difficulties such as these rise at each step, he adds, in our paleontological studies, and it has resulted from his work, "that instead of establishing zoological connections, and a gradual transition between the different types of Silurian Crustacea, on the contrary the contrasts in their conformation were not less during those primitive ages, than in those posterior, and that the suddenness of appearance of each of them, with the completeness

of their organization, is irreconcilable with the progressive and successive evolution that these theories suppose."

We have been unwilling, with the *Eozoön Canadense* generally received as a proof of the existence of life in the Laurentian period, to believe that the Bohemian strata, investigated so ably by M. Barrande, represent the lowest platform of life.

Mr. Henry Hicks in a recent number (Feb. 5) of "Nature" claims that M. Barrande's list of fossils from the Cambrian formation of England is very incomplete. Instead of there being "no trace of a trilobite" in the Cambrian formation, Mr. Hicks has found sponges, annelides, brachiopods, pteropods, bivalved Crustaceans and trilobites; among the latter a low genus (Microdiscus) with four thoracic segments; the genus has also been found in Canada. It seems best, then, for paleontologists to suspend their judgment, and await the discovery of new facts before pronouncing for or against a primordial fauna more ancient than the Cambrian even. Considering what remarkable intermediate types have been discovered of late in the Rocky Mountains, the advocates of evolution can well afford to wait patiently for a solution of these knotty problems in biology.

Monograph of the Whale Lice.—A full account of the various species of Cyamus, or so called whale louse, with many figures, has been published in the "Memoirs of the Scientific Society of Copenhagen" by Dr. Lütken. These troublesome crustaceans, allied remotely to the common beach-flea, cling by means of their long claws to the more protected and softer parts of whales, such as the bowhead, the humpbacked, the sperm whales, narwhal and grampus, while they have never been found on the Balænoptera, or fin back whale.

GEOLOGY.

The Carboniferous Formation of South America.—An examination of the rich brachiopod fauna, collected by Prof. Hartt and his party on his two late expeditions to the Amazonas, from Itaituba, just below the lower falls of the river Tapajos, shows that the carboniferous beds at that place belong to the coal measures.

Associated with a number of new species soon to be described, there are found at that locality, *Spirifera camerata* Morton,

S. apima Hall, *S. plano-convexa* Shumard, *Ritzia punctulifera* Shumard, and a number of other species characteristic of the North American coal measures.

Mr. Chandless collected carboniferous fossils from the Paranary and Amana, branches of the Maué-assir, a tributary of the Amazonas between the Tapajos and Madeira. The localities are about one hundred miles west of Itaituba, and the beds and fossils are the same as at that place, as is proved by specimens kindly presented by Mr. Chandless.

A specimen of rock given me by Sr. Gabriel Vierra Lobes of Abydos, and said to have been found on the river Trombetas, contains some of the same species and is interesting since it indicates the occurrence of the same formation on the north side of the Amazonas, where Devonian rocks also occur.

It is interesting to notice in this connection that the Brachiopods described by d' Orbigny, Salter and Zoula from Lake Titicaca, Santa Cruz, and Cochabamba in Bolivia are in great part identical with the Brazilian and North American coal measure forms, and are in all cases more nearly allied to them than to any others.

In a small collection of Peruvian fossils forwarded by Prof. Orton for examination, I have recognized *Ritzia punctulifera* Shumard, and *Spirifera camerata* Morton (*S. Condor* d' Orb.), in a pebble from the bed of the Pichis River, a branch of the Pachitea, one of the western tributaries of the Ucayali. This is a new locality for the carboniferous situated about six degrees north of Lake Titicaca.

Carboniferous beds in the south of Brazil in the provinces of Santa Catharina and Rio Grande do Sul, are described in Prof. Hartt's Geology and Physical Geography of Brazil. These are also of coal measure age, containing workable beds of coal with characteristic coal plants. — O. A. Derby.

Analogy of the Tertiary Fauna of France to the Temperate Regions of America.—MM. Sauvage and Oustalet, in a late meeting of the Société Philomathique of Paris, remarked that all the analogies of the ichthyological and entomological fauna of France during the oligocene (a division of the Tertiary) period were with those of the temperate regions of (North?) America, leading to the opinion that Europe and America were united at this epoch.

On the contrary, considerations drawn from physical geography, and especially the deep sea soundings made by the "Challenger," seem to go against the view of intercontinental bridges held by some naturalists. We look for a solution of the resemblance of the tertiary fauna of Europe and north temperate America, to a study of the tertiary lands of Arctic America, Greenland and Spitzbergen, from which the European forms of an American type may have emigrated in preglacial times.

ANTHROPOLOGY.

THE PYGMIES OF CENTRAL AFRICA.— Dr. Schweinfurth has studied and drawn the Akka or pygmy race of Central Africa, whose average height is four feet six inches. The statements of Herodotus and Aristotle are thus fully confirmed.

MICROSCOPY.

AMPHIPLEURA PELLUCIDA IN DOTS.— A $\frac{1}{50}$ objective was made by Tolles to my order, and finished on the 12th of March, 1873. The angle of aperture as invoiced by Mr. Stodder is 165°. From my measurements I think the objective is correctly named by the maker. At the extreme open point it is a good $\frac{1}{4}\frac{1}{0}$th dry. The screw-collar has twelve divisions: by turning it eight divisions it is adjusted for uncovered wet, and four divisions remain to adjust for cover for immersion work. It works through covering glass of about $\frac{1}{2}\frac{1}{0}$th of an inch, but it is better to use thinner glass, or mica, to enable the observer to focus through specimens.

With lamp-light and the $\frac{1}{5}\frac{1}{0}$th the resolution of *Amphipleura pellucida* is better than I have before seen. Using ordinary daylight, Vibriones, Bacteria, etc., are well defined, especially when a Kelner eye-piece is used as a condenser.

With sunlight and the ammonia-sulphate of copper cell, *Surirella gemma* yields longitudinal striæ, and, as the direction of the light is changed, rows of "hemispherical bosses" as described by Dr. Woodward.

With the same illumination specimens of *Amphipleura pellucida*, mounted dry, by Norman, were resolved and counted with perfect ease and remarkable plainness, the striæ being still distinctly visible with No. 3, eye-piece, draw-tube extended six inches, and power upward of 10,000 times.

It is with hesitation that I remark further that the $\frac{1}{50}$th has resolved the lines of *Amphipleura pellucida* into rows of dots, for the "beaded" structure of the easier test, *Surirella gemma*, is still doubted by some experienced microscopists. But "facts are stubborn things" and the facts are that with Wenham's parabola as an illuminator the dots are seen, and with either the paraboloid or the Amici prism longitudinal lines much finer than the transverse ones are brought out. These lines, which I consider genuine, count not far from 120,000 to the inch. With a slight change of the adjustment their place is occupied by spurious lines counting generally about 60,000 to the inch. The longitudinal lines can only be seen when the focus is best adjusted for the transverse striæ. When the transverse lines are examined, they may be shown smooth and shining, similar to the photograph by Dr. Woodward in the NATURALIST, but much better. If the mirror is then carefully touched a sinuate appearance of the margins of the lines suggestive of beading is seen. This appearance can be brought out readily. And finally after the most painstaking manipulation, and when without doubt the best work is being done, the separated dots or beads appear. — G. W. MOREHOUSE.

ON CIRCULATORY MOVEMENT IN VAUCHERIA. — Prof. Leidy made some remarks on the intra-cellular circulation of plants, as exemplified in the hairs of the mullein, the leaf-cells of Vallisneria, etc. The moving streams of protoplasm he likened to amœboid movements, and expressed the opinion that they were of the same character. In the common alga, Vaucheria, the filaments of which consist of very long cells, comparable to those of Nitella or Chara, he had observed an apparent motion of the cell contents, which is somewhat peculiar and, at least, is not generally mentioned by writers. The wall of the cells is invested on the interior with a layer of tenacious protoplasm, containing the thinner liquid cell contents as usual. The parietal protoplasm is closely paved with green granules, and these appear very slowly but incessantly to change their position in relation with one another. The motion is so slow that it was a question for some time whether it did actually occur, but it appears sufficiently obvious if observed in relation with the lines of a micrometer, and its existence was confirmed by several friends whose attention was directed to it. — *Proceedings Academy of Natural Sciences, Philadelphia.*

NOTES.

We have received the report of the House Committee on Public Lands concerning the geographical and geological surveys west of the Mississippi. The Committee conclude that the "surveys, so far as the same are necessary for military purposes, should be continued; that all other surveys for geographical, geological, topographic and scientific purposes, should be conducted under the Department of the Interior." The Committee also recommended the consolidation of Powell's with Hayden's survey, under the Department of the Interior. This has since been done, and Congress has voted $75,000 for the continuance of Hayden's, and $15,000 for that of Powell's survey. The continuance of Lieut. Wheeler's survey was previously provided for, $30,000 having, we believe, been voted for its expenses. We are glad to see that a step has been taken towards a consolidation of the geological and geographical surveys of the territories of the west. We believe that the scientific interests of the country will be thus furthered, and greater unity, economy and scientific accuracy be secured.

The work should not stop here, and we look forward to a coöperation between the national government and the states in carrying on the survey of the states; in fact, it has partially been begun. This is extremely necessary in the preparation of a general map, geographical and geological, of the United States. More than this, it would be, if we mistake not, a wise and economical measure to unite the work of the Coast Survey and the Signal Bureau with that of the national geographical and geological surveys. When this has been brought about, as it may be thought necessary to do at a future not far distant, all these bureaus might still farther be united under a Science Department, equivalent to the Department of State, of War, the Navy or the Interior, with the officer at the head a member of the Cabinet, to be perhaps appointed by the President under the advice of the heads of the respective bureaus of the Science Department; these bureaus to be those of Physics, Chemistry, Astronomy, Geology and Mining, Meteorology, Geography, Biology and Agriculture, Anthropology and Education, etc., etc.

Such an organization of the scientific forces of the country is already foreshadowed in that of the Smithsonian Institution,

which, by its intimate relations with the government, and the national influence it has acquired through the wise and able administration of its affairs, has become even now almost in part the equivalent of a government department.

It is suggested that at the annual meetings of our scientific and learned bodies, some action be taken towards directing public attention to the need of a well organized Department of Science to look after the interests of a broad and generous scientific culture, physical, biological and social, or relating to any other branch of science which may aid in the elevation and improvement of our people.

On June 2d the corner-stone of the American Museum of Natural History, in course of erection on Manhattan Square, New York, was laid in presence of an audience numbering 5000 people. Scientists were invited from various parts of the country. Robert L. Stuart, President of the Museum Association, delivered an address in behalf of the trustees, which was followed by an address by Governor Dix, and one by Professor Joseph Henry. The corner-stone was laid by President Grant. We have seen the plans of this great structure, which is designed to cover eighteen acres, and cost when completed $6,000,000. It will be exceedingly handsome, imposing and convenient. In his address Professor Henry said that the great institution they were inaugurating would not be complete without provision for regular courses of free lectures and the presence of a body of scientific investigators who should give the results of their studies to the country. In congratulating the citizens of New York on the brilliant material prospects of this museum, we indulge the hope that the advice of Prof. Henry may be promptly carried out, and, that the impetus it may, under good management, give towards elevating the culture of our country be commensurate with the amusement it will afford to the people of the great city in which it is located.

We are glad to learn that the value of applied entomology is felt by the people of New York. The Legislature of 1872, as we have recently learned, passed the following resolve:—"The sum of fifteen hundred dollars is hereby appropriated to be paid to Asa Fitch for revising and completing for publication his survey of the noxious and other insects of the state, the state to have the right to publish at all times any number of copies of said work for its own use without further payment. Dr. Fitch's first report was

published in 1856; fourteen in all have appeared, being published in the "Transactions of New York State Agricultural Society." No extra copies of the last four reports have been published, and they are exceedingly difficult to obtain. They are interesting, full of fresh observations and deserve the widest circulation.

It appears that for two years the grasshoppers have so devastated several counties in Minnesota and Iowa that the settlers are impoverished, and the earth is now so full of grasshoppers that the soil cannot be tilled for at least one year. A bill was passed by Congress permitting the settlers in all these counties to abandon their land for one year, without prejudice to their rights under the preëmption laws, so that they may support their families elsewhere.

We have before us the first number (May) of "Psyche," the organ of the Cambridge Entomological Club, edited by B. P. Mann (8vo, pp. 4). This timely issue will, besides the matter we may expect to find in such a journal, contain a list of all writings upon entomology published in North America from the beginning of 1874, with a brief note of the contents of each. The subscription price is $1.00.

It is understood that Dr. A. W. Chapman offers his Herbarium for sale. It must be rich in specimens of southern plants, and especially valuable as containing the types of many species described in his "Flora of the Southern United States." His address is Apalachicola, Florida.—W. M. C.

The Botanical Congress of Europe began its sessions under the presidency of Dr. J. D. Hooker at Florence. An interesting report of the meeting will be found in the London Journal of Botany for June and July.

There is a flourishing Natural History Society in New Albany, Indiana, with a fine local collection of Indian remains, some of much rarity. The collections in other departments are very creditable.

The well known entomologist G. A. Herrich-Schæffer, died at Ratisbon, Germany, on the 14th of April, aged 75 years.

The distinguished geologist, Professor John Phillips, died at Oxford, England, on the 24th of April, aged 73 years.

CLAUDE GAY, who wrote a large volume on the history, zoology and botany of Chili, recently died, in his seventy-fourth year.

EXCHANGES.

HAIR OF DERMESTES.—Larvæ of *Dermestes* with test-hairs *in situ*, for good microscopic objects.—R. H. WARD, 53 *Fourth Street, Troy, N. Y.*

BOOKS RECEIVED.

Descriptions of New Species of Goniatidæ. With a list of previously described species. By James Hall. 1874. 8vo.

The Science of Homeopathy; or, A Critical and Synthetical Exposition of the Doctrines of the Homeopathic School. By Charles J. Hempel. Cloth, $1.75. Boericke & Tafel. New York, Philadelphia, Baltimore, San Francisco, 1874. pp. 177. 8vo.

The Geological and Natural History Survey of Minnesota. The Second Annual Report, for the Year 1873. By N. H. Winchell and S. F. Peckham. St. Paul, 1874. pp. 75-219. 8vo.

The Organization and Progress of the Anderson School of Natural History at Penikese Island. Report of the Trustees for 1873. Cambridge, 1874. 8vo.

Annual Report of the Trustees of the Museum of Comparative Zoology, at Harvard College, in Cambridge; Together with the Report of the Committee on the Museum, for 1873. Boston, 1874. 8vo.

Urethrotomy, External and Internal Combined, in Cases of Multiple and Difficult Stricture; with Remarks on the Urethral Calibre. By Fessenden N. Otis. New York, 1874. 8vo.

Descriptions of Bryozoa and Corals of the Lower Helderberg Group. By James Hall. Albany, 1874. 8vo.

On the Plagopterine and the Ichthyology of Utah. By Edward D. Cope. Philadelphia, 1874. 8vo.

Catalogue of the Coleoptera of Mt. Washington, N. H. By E. P. Austin; *With Descriptions of New Species*, by J. L. LeConte. Boston. 8vo.

Birds of Western and Northwestern Mexico. Based upon Collections made by A. J. Grayson, J. Xantus and Ferd. Bischoff. By George N. Lawrence. Boston. 4to.

Descriptions of Six Supposed New Species of American Birds. By George N. Lawrence. New York. 8vo.

Entomological Contributions. No. III. By J. A. Lintner. Albany. May, 1874. 8vo.

The Butterflies of North America. By W. H. Edwards. Second series, Part 1. Published by Hurd & Houghton, New York. May, 1874. 4to.

Catalogue of Flowering Plants of the Southern Peninsula of Michigan, with a few of the Cryptogamia. By N. Coleman. Kent Scientific Institute. Miscellaneous Publications. No. 2. Grand Rapids, 1874. 8vo.

Catalogue of Plants Growing Without Cultivation in the State of New Jersey, with a Specific Description of all the Species of Violet found therein. By Oliver R. Willis. J. W. Schermerhorn & Co., Publishers: New York, 1874. 8vo.

Anatomy of the Invertebrata. By C. Th. V. Siebold. Translated from the German with Additions and Notes by Waldo I. Burnett. James Campbell, Publisher. Boston. 1874. pp. 470. 8vo.

Sixth Annual Report on the Noxious, Beneficial, and other Insects of the State of Missouri, made to the State Board of Agriculture, pursuant to an Appropriation for this purpose from the Legislature of the State. By Charles V. Riley. Jefferson City, 1874. 8vo.

Instructions for Observing the Transit of Venus, December 8-9, 1874. Prepared by the Commission authorized by Congress and printed for the use of the observing parties by authority of the Hon. Secretary of the Navy. Washington, 1874. 4to.

Geographical and Geological Explorations and Surveys West of the 100th Meridian.

Astronomical Report. By Lieut. George M. Wheeler. Washington. 1874. 4to.

On the Transformations of the Common House Fly, with Notes on Allied Forms. By A. S. Packard, jr. 1874. pp. 14. 8vo. With a plate.

Descriptions of New North American Phalænidæ and Phyllopoda. By A. S. Packard, jr. 1874. pp. 18. 8vo.

The Influence of Climate and Topography on our Trees. By J. G. Cooper. 8vo. From the Proceedings of the California Academy of Sciences, March 16, 1874.

The Mezquite Bean. By J. G. Cooper. From the Scientific Press. San Francisco, Nov. 4, 1871. 4to.

Psyche. Organ of the Cambridge Entomological Club. Edited by B. Pickman Mann. Vol. 1, No. 1. Cambridge, Mass., May, 1874. pp. 4. 8vo.

Observer of Nature. Vol. 1, No. 2. Lawrence, Kansas. Wednesday, April 29, 1874.

Les Cristalloides Complexes a Sommet Etoile. Par Leopold Hugo. Paris, 1872. 8vo.

Essai sur la Geometrie des Cristalloides. Par Leopold Hugo. Paris, 1873. 8vo.

Introduction a la Geometrie Descriptive des Cristalloides. Par Leopold Hugo. Paris, 1874. 8vo.

Y a-t-il des Faunes Naturelles Distinctes a la Surface deu Globe, et quelle Methode doit-on employer pour arriver a les definer et les limiter? Extrait des Annales de la Societe Entomologique de Belgique. Par A. Preudhomme de Borre. 1873. 8vo.

Organ der deutschen Gesellschaft fur Anthropologie Ethnologie and Urgeschichte. Archiv fur Anthropologie. Zeitschrift fur Naturgeschichte and Urgeschichte des Menschen. Von Friedrich Vieweg und Sohn in Braunschweig. 1874. 4to.

Schriften der Naturforschenden Gesellschaft in Danzig. Neue Folge. Vol. 3, Parts 1-2. Danzig, 1872-1873. 8vo.